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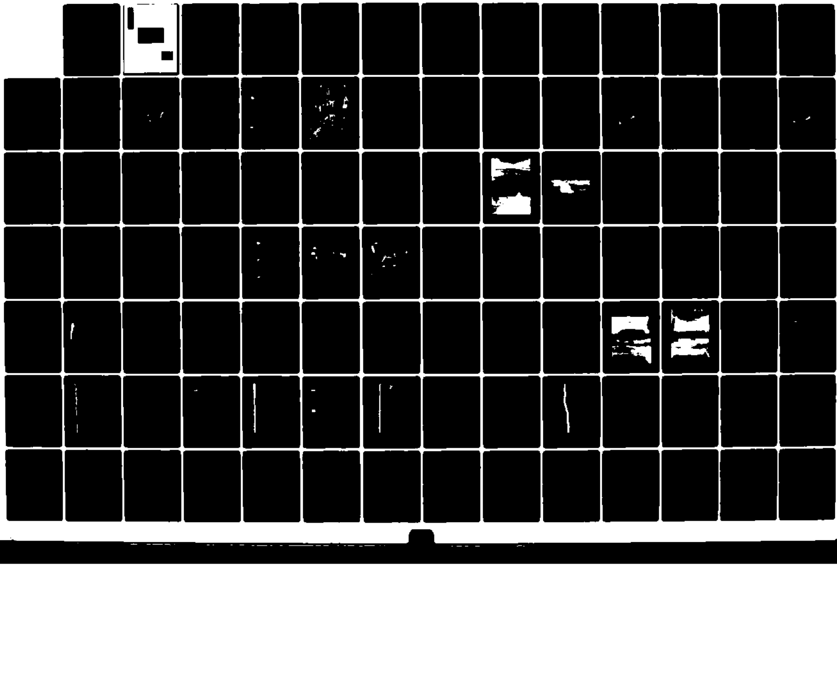

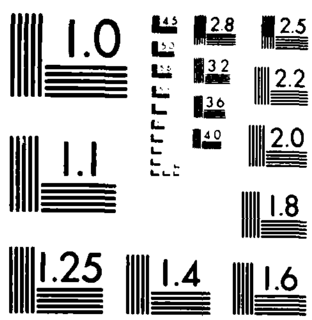

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A129	3. RECIPIENT'S CATALOG NUMBER 124
4. TITLE (and Subtitle) Phase III Archaeological Test Excavations Hagerman National Fish Hatchery Site 10GG176 Gooding County, Idaho		5. TYPE OF REPORT & PERIOD COVERED Final Report
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Daniel G. Landis and Gordon A. Lothson		8. CONTRACT OR GRANT NUMBER(s) DACW68-81-C-0125
9. PERFORMING ORGANIZATION NAME AND ADDRESS Archaeological and Historical Services Eastern Washington University Cheney, Washington 99004		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Corps of Engineers, Walla Walla District Bldg 602, City-County Airport Walla Walla, Washington 99362		12. REPORT DATE 1983
		13. NUMBER OF PAGES 228
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

Approved for public release; distribution unlimited

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Hagerman National Fish Hatchery
pithouses
Fremont Culture
Shoshoni Culture
subsistence activities

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Archaeological site 10GG176 is located in southeastern Idaho on the grounds of the Hagerman National Fish Hatchery where expansion of hatchery facilities is planned. Three phases of archaeological test excavations were done to identify the nature and extent of the cultural resources in proposed construction areas. The third phase of testing covered five such construction areas. It appears that most, if not all, of the significant cultural resources at 10GG176 have been avoided successfully.

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PHASE III ARCHAEOLOGICAL TEST EXCAVATIONS
HAGERMAN NATIONAL FISH HATCHERY
SITE 10GG176
GOODING COUNTY, IDAHO

by

Daniel G. Landis

and

Gordon A. Lothson

With contributions by

Ricky Linse

Principal Investigator: Harvey S. Rice

1983

A report submitted to the Walla Walla District
U.S. Army Corps of Engineers, in partial fulfillment of
contract no. DACW68-81-C-0125

Archaeological and Historical Services
Report No. 100-28
Eastern Washington University Reports in Archaeology and History
Cheney, Washington 99004

ABSTRACT

Archaeological site 10GG176 is located on the grounds of the Hagerman National Fish Hatchery near the Snake River in southeastern Idaho. Construction plans to expand the Hatchery's facilities have been altered twice in attempts to avoid adverse impacts to the cultural resources. Archaeological test excavations were done on three occasions (1979, 1980, and 1981) to identify the nature and extent of the cultural resources in proposed construction areas. This is the report of the third phase of testing for five such construction areas.

Historically, the Oregon Trail was on the opposite bank of the Snake River; however, no significant historic component has been identified at 10GG176. Pithouses and other features were discovered in 1979 along the south bank of Riley Creek. In 1980 testing uncovered additional cultural resources to be avoided, but no additional features. Although ethnohistoric Shoshoni villages were located in southeastern Idaho, some archaeologists suggest that many archaeological manifestations in the region may be attributable to a northern variant of Great Salt Lake Fremont culture prior to settlement by the Shoshoni. Avoidance of significant cultural resources at 10GG176 preserves data to address this and other questions in the future, but precludes definitive answers at this time.

The environmental setting of 10GG176 is described with attention to variables that could have affected the archaeological record, including flora and fauna that could have been exploited by prehistoric inhabitants of the site. Discussion of climatic variables includes the applicability of Antevs' (1948) paleoclimatic scheme and Butler's (1978) suggested alternative scheme for southeastern Idaho.

Field and analytic methods are outlined for the third phase testing. Very few non-lithic cultural items were found. The frequency of cultural material increased with proximity to the known pithouses. Cultural diagnostics include a few Shoshoni-like ceramics, but these are not definitive, and many of the projectile points could be either Shoshoni or Fremont. General discussion of the cultural materials recovered appears in the text with detailed descriptions and measurements presented in Appendix B. The original construction of the fish hatchery facilities disturbed the sediments in large areas of the site, and detailed stratigraphic information is presented in the text and in Appendix C.

The potential to yield significant archaeological information is discussed for each of the five construction areas tested. Although Area V, closest to the known pithouses, has the greatest potential, it appears that most, if not all, of the significant cultural resources at 10GG176 have been avoided successfully. Other than monitoring, no recommendation is made for further archaeological work at the site, but construction should be confined to designated work areas. Efforts should be made to nominate 10GG176 to the National Register of Historic Places.

ACKNOWLEDGEMENTS

Many people have contributed their time, energy, services, and knowledge to this project. The field crew consisted of Jennifer Ayers, Andrea Eyer, Janet Flett, Marlea Linse, Ricky Linse, Gordon A. Lothson (director), Todd Metzger, Mark Varian, and Keith Virga. Their efforts are greatly appreciated. The field work could not have been accomplished without the cooperation of Dave Bruhn and Tom Shaw, Manager and Assistant Manager, respectively, of the Hagerman National Fish Hatchery.

Joe McMichael, Project Manager for the Walla Walla District of the U.S. Army Corps of Engineers, is appreciated for allowing revisions to the scope-of-work that made data-gathering more meaningful. The cooperation of LeRoy Allen, Archaeological Coordinator for the Corps, and his assistant, John Leier, also are gratefully acknowledged--without you the challenges would have been even greater.

Advice and special knowledge of the site and of the Hagerman Valley were offered by Thomas Green, Idaho State Archaeologist, and Max G. Pavesic of Boise State University. However indirect it may seem, they have contributed much to the report.

Marsha Krebbs and Barbara Jeanne Rice of Columbia Plateau Studies (Archaeological and Historical Services), Eastern Washington University, helped administer the contract and edit the original draft report. Gordon A. Lothson, Ricky Linse, and Keith Virga prepared the original draft (1982). That draft was typed by Sue Gamman. Gordon prepared the original figures for the draft and final report. Subsequently, figures were modified by Barbara Jeanne Rice, Dan Landis, and Priscilla Wopat. Priscilla also typed and retyped all of the final tables and soil profile descriptions and reviewed the editing of the final text. Dan Landis typed the final text. Mona Ries helped type Appendix B, and, as usual, helped manipulate it all on the word processor.

A special note of thanks must be extended to the Principal Investigator, Harvey S. Rice, for his confidence, advice, patience, and understanding throughout this project--though not necessarily in that order.

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FOREWORD

Gordon Lothson prepared the first draft of this report with considerable input from Ricky Linse and Keith Virga. Gordon gave Ricky and Keith junior authorship on the draft, but states in the acknowledgements, "Any errors in either interpretation or content are the responsibility of the principal author, G. A. Lothson." Although the text of the draft was written by Gordon, in using it to prepare this report, I have cited the draft as "Lothson et al. 1982." I have made radical changes in the manner of presentation and have rewritten the text completely. Gordon's descriptions of the cultural material have been taken from the draft text nearly verbatim, and they appear in Appendix B of this report. Due to his efforts in the preparation of the draft manuscript, Gordon is maintained as junior author for this final report. The structure of this report's presentation, the representation of the data, and much of the conclusions are my own responsibility. I cannot be responsible for Gordon's logic and conclusions, and he cannot be responsible for mine.

Daniel G. Landis
Archaeological and Historical Services

PART I

INTRODUCTION

The Hagerman National Fish Hatchery is located along the Snake River in south-central Idaho near the town of Hagerman in Gooding County (Figure 1). The facilities associated with the hatchery are to be expanded, and although the facilities themselves are not operated by the U.S. Army Corps of Engineers, the Corps is responsible for administering the land upon which the hatchery is situated and which includes archaeological site 10GG176.

The Walla Walla District of the Corps contracted with Archaeological and Historical Services (AHS), Eastern Washington University, Cheney, Washington, to complete the third phase of archaeological investigations at 10GG176. The initial phase of investigation was done in 1979 by crews from Boise State University (Pavesic and Meatte 1980). Cultural remains of considerable archaeological significance, primarily prehistoric pithouses and other pit features, were located by subsurface testing in part of the site. Construction plans for the hatchery subsequently were modified to avoid these cultural resources.

Archaeological and Historical Services (AHS) was contracted to test the new areas chosen because of the modifications; the second phase was reported in Lothson and Virga (1981). Additional cultural resources were located and necessitated further modification of construction plans. This third phase (i.e., the present study) is quite similar to the second phase insofar as additional new impact areas were included in the testing program carried out by AHS in 1981. Each additional area of the site tested was evaluated in

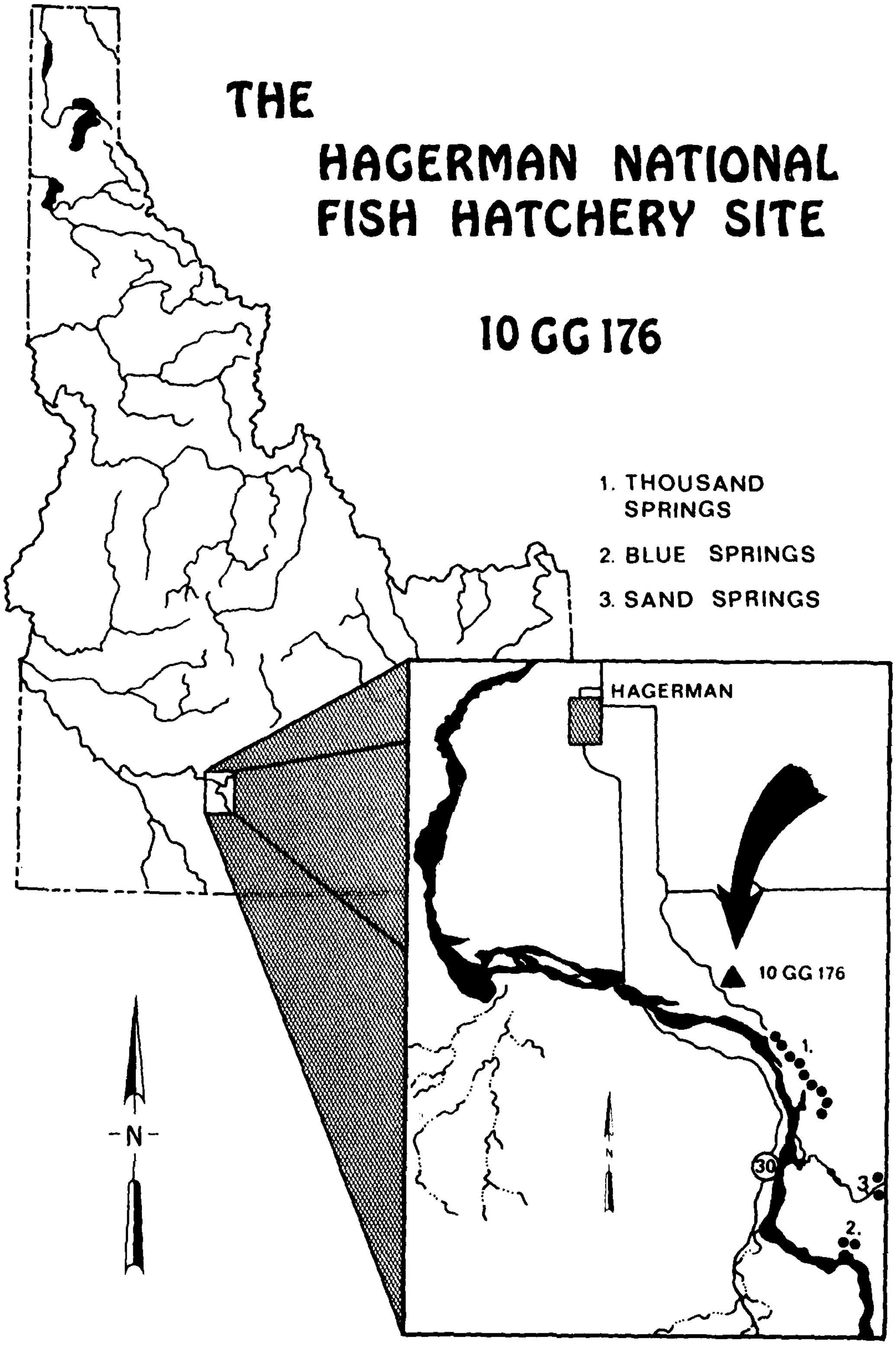


Figure 1. Location of the Hagerman National Fish Hatchery site (10GG176).

terms of the criteria of eligibility for the National Register of Historic Places (NRHP) as defined in 36 CFR 60, Part 60.6. Particular attention was given to identifying prior disturbance of deposits and the density and distribution of cultural materials in the tested areas.

Fieldwork for the current project was done from late July through September 1981. Harvey S. Rice served as Principal Investigator, and Gordon A. Lothson was Field Director. In addition, Lothson directed and analyzed much of the data and provided a draft manuscript of the report.

Previous Investigations at 10GG176

Pavesic and Meatte (1980)

Seven research areas were designated by Pavesic and Meatte after their 1979 fieldwork as part of a proposed mitigation plan (1980:Figure 21). However, avoidance measures were pursued instead of extensive archaeological mitigation. Nonetheless, the research area designations proved to be heuristically convenient and were used in subsequent investigations by Lothson, who added area designations VIII in 1980 and IX and X in 1981.

The work of Pavesic and Meatte (1980) identified several ("five or six") prehistoric dwellings and noted that others may be located on the site. Saucer-shaped pithouses up to 3.3 m in diameter were discovered in subsurface excavations. The tops of some of the features were at the base of the modern sod line; others were found at 0.25 m below ground surface. These pithouse depressions were discovered in Research Area II (Figure 2) and were filled with lithic debris and artifacts, bone, shell, ash, and charcoal; buried storage pits were found in association with them.

Key to Figure 2*

STRUCTURES

FISH RACEWAYS

ASPHALT ROADWAYS

SWAMPS AND LOWLAND AREAS

ARCHAEOLOGICAL AREAS

TREES

RILEY CREEK

WIRE

*Contour intervals are 2 ft.

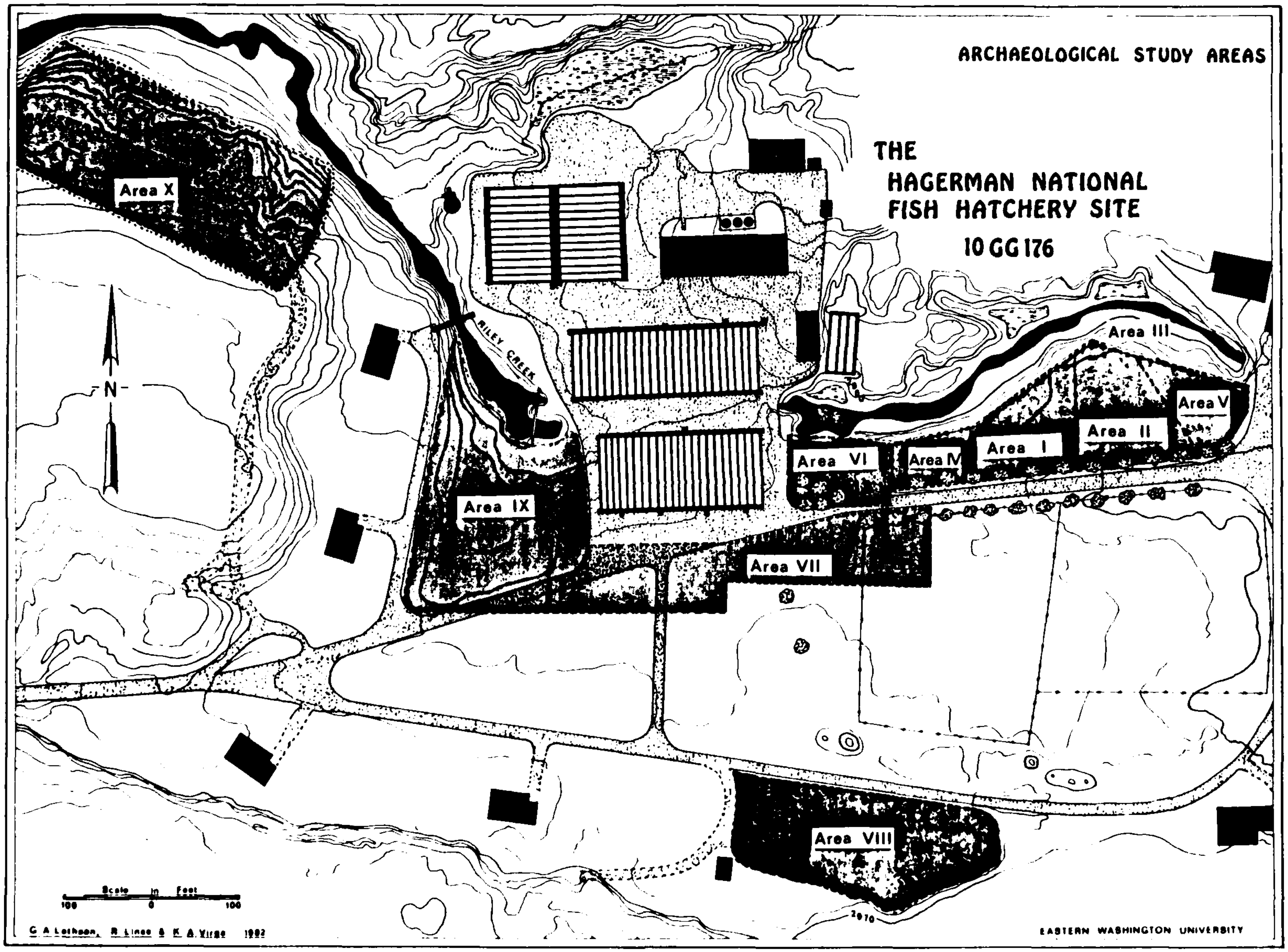


Figure 2. Study areas designated at 10GG176.

A wide variety of artifacts representing numerous activities were recovered. Most, if not all, stages of lithic reduction are represented. The projectile points reflect northern Great Basin as opposed to Columbia Plateau styles, and include four Elko corner-notched, two corner-removed, two Eastgate expanding stem, five Rose Spring corner-notched, and three small side-notched (Pavesic and Meatte 1980:78). These types are noted to occur from 2000 B.C. to A.D. 1200 in the Great Basin (Hester and Heizer 1973 in Pavesic and Meatte 1980:78). One complete mortar and two large mortar fragments were found in one storage pit feature. Mortars are assumed to have been used in plant food processing (e.g., camas), but two specimens retained residue from crushed red ochre as well. Faunal remains included species inhabiting the canyon itself and those living outside of it.

Limited quantities of Southern Idaho Plain Ware and Shoshoni Ware pottery were also recovered from 10GG176 (Pavesic and Meatte 1980:66-68, Figure 18). Both of these pottery types are of a later time-frame (A.D. 1222-1550) in southern Idaho (Pavesic and Meatte 1980:78-79) than are the projectile point types. Pavesic and Meatte (1980:79) conclude that a time range of A.D. 50-1350 is the best estimate for the occupation of the main site area (i.e., Area II, and probably Areas I-V). Butler (1981), however, recently has questioned the association and time-frame of many Shoshoni material culture "traits" and considers many of these traits as late-surviving manifestations of the Utah Fremont culture (see below). Unfortunately, the three radiocarbon samples sent to the Washington State University Radiocarbon Dating Laboratory contained insufficient material for dating (Tom Green 1982:personal communication).

Pavesic and Meatte (1980:79) suggest that the original fish hatchery was constructed on "the major portion" of 10GG176. However, this would have been prior to the current cultural resource management regulations. Much of of the prehistoric village site still remains intact.

Lothson and Virga (1981)

The 1980 fieldwork of Lothson involved test excavations in portions of Areas VI, VII, and VIII to be impacted by construction under the modified plan. Analysis was minimal and confined to descriptive procedures. The goal was to determine whether or not the avoidance measures were adequate. Areas VII and VIII were considered ". . . unlikely to yield important archaeological data" in terms of NRHP criteria (Lothson and Virga 1981:95). However, Area VI was considered to have the potential to contribute further significant archaeological data, and Lothson and Virga recommended limited additional archaeological investigation at 10GG176. Further modification of the construction plans and the addition of two more impact areas (Areas IX and X) resulted in the need for a third phase of testing at the site.

The second phase findings did not contradict the basic interpretations of Pavesic and Meatte (1980). However, Lothson's identification of so much "obsidian" at 10GG176 in the second and third phases is questionable. Most of the material is actually vitrophyre and is probably from the Brown's Bench locale to the southeast (Sappington 1982:personal communication; Galm 1982:personal communication). Pavesic and Meatte (1980:77) note a predominance of "ignumbrite" [sic] in their collection of projectile points from 10GG176. Ignimbrite is a term often used interchangeably with vitrophyre, but the former is more descriptive of the formation, while the latter is more descriptive of the material itself. Vitrophyre forms in ash flows as a

glassy volcanic material, but it is not obsidian, and is quite opaque even on thin margins (Sappington 1982:personal communication). Sappington found numerous deposits of vitrophyre in the vicinity of 10GG176 while surveying there. A brief examination of the third phase lithic collection from 10GG-176 identified much vitrophyre but very little obsidian, and it must be assumed that the same is true of the second phase collection.

The Regional Archaeological Context

Prehistory

Aboriginally, the Upper Snake River area of southern Idaho is one of the oldest continuously occupied regions of North America. Archaeological sites are numerous on the Snake River Plain, and some investigators have suggested that human occupation may have begun there as early as 40,000 years ago (cf. Hopkins and Butler 1961; Bryan 1978). However, this extensive time depth is based on extremely limited and problematical data. There is much better evidence in the region for the classic sequence of projectile point styles of Clovis, Folsom, and Plano associated with such big game animals as mammoth, horse, camel, and bison (Butler 1978:74). This sequence in southern Idaho has as great a time depth as may be found anywhere in North America, including the High Plains, the Great Basin, and the Southwest. Some of the earliest firmly dated evidence of man in the New World derives from Wilson Butte Cave ("Stratum C") which dates to 12,550 ± 500 B.C. (Butler 1978:11-12). Wilson Butte Cave is located 56 km east of 10GG176.

Butler (1978) provides a detailed discussion of the history of archaeological investigations in the Upper Snake and Salmon River areas of southern Idaho. The major sites from his discussion are located in relation to

10GG176 in Figure 3. Pavesic and Meatte (1980:18) also note several early regional chronologies postulated for the area (Shellback 1930; Olsen 1940; Swanson 1958). Since the 1950s, the literature on archaeological investigations in the area has become extensive. Some of the more important studies in the region have been at: Wilson Butte Cave (Gruhn 1961a); Pence-Deurig Cave (Gruhn 1961b); Bison and Veratic rockshelters in Birch Creek valley (Swanson 1972); Bighorn shelter (Ranere 1971); the Wasden site (Butler 1969, 1978); Nahas Cave (Plew n.d.); the Haskett site (Butler 1965); the Redfish Lake overhang (Sargeant 1973); the Challis Bison Jump (Butler 1971); Weston Canyon rockshelter (Miller 1972; Delisio 1970); the Poison Creek site (Neudorfer 1976); the Mecham site (Gruhn 1960); the Brown's Bench site (Bowers and Savage 1962); the Rock Creek site (Green 1972); the Dry Creek rockshelter (Webster 1978); and several others. Much of this information has been synthesized in a variety of interpretations for the region or parts thereof. Some of the more significant of these are Butler (1978, 1981), Swanson (1958, 1965, 1972), and Madsen (1975).

In addition there have been numerous archaeological survey reports resulting from state, federal, and private land management projects. However, they are quite limited in scope, are basically descriptive in nature, and offer little additional interpretations to the studies noted above. These reports include: Bucy (1971), Cole et al. (1975), Keeler and Koko (1971), Moe et al. (1980), Murphy (1977), Ostrogorsky and Plew (1979), Pavesic and Hill (1973), Pavesic and Moore (1973), Plew (1976, 1978), Struthers (1976), Swanson et al. (1959), and Tuohy (1958, 1963). Their value is basically in creating site inventories. Site types identified include cave sites, rockshelters, open-air sites, small camps, pithouse villages, fishing and

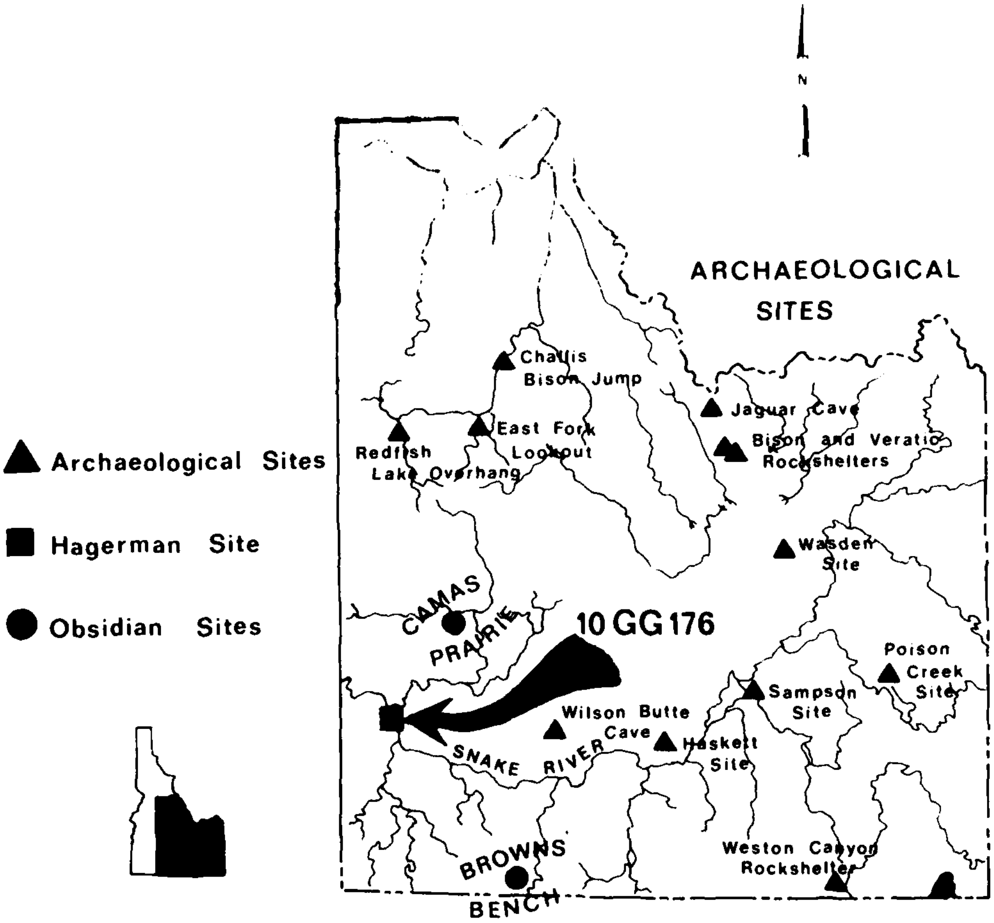


Figure 3. Archaeological sites and obsidian/vitrophyre source areas in southeastern Idaho (adapted from Butler 1978:Figure 3 and Moe et al. 1980:14).

hunting camps, rock art sites, rock alignments, burial sites, and kill sites (cf. Pavesic and Meatte 1980:15-16; Butler 1978:55).

It is apparent that southern Idaho is a very rich archaeological area. It is also apparent that there is a substantial body of data available on this archaeology. However, the meaning of the information provided in the literature is controversial, and there are some gaps in the distribution of reported sites in southern Idaho and the Snake River Canyon. For instance, the Hagerman valley is relatively unknown archaeologically (Pavesic and Meatte 1980:12). Furthermore, a definitive archaeological synthesis of southern Idaho remains to be written, and some authors have changed their points of view through re-evaluation of old data, most notably Butler (cf. 1978, 1981). The basic elements of the controversies are outlined below.

The length of human occupation in southern Idaho is well established. Although there is no clear temporal break between the Early Big-Game Hunting tradition and the subsequent (early) Archaic tradition, the projectile point styles of the Archaic (side-notched and stemmed, indented base) appear at the Wasden site above a mass bison kill dated to 6000 B.C. (Butler 1978: 67-68). The Archaic tradition is separated into three periods (Early, Middle, and Late) by Butler (e.g., 1978:67-75) and extends into historic times. Butler (1978:74) also notes that

> All periods of the Archaic appear to have a close relationship with Archaic manifestations in the Great Basin, but present indications are that the hunting of big game, especially bison and mountain sheep, continued to be of importance in the Upper Snake and Salmon River Country.

The first Euroamericans in this area encountered the Shoshoni in short-term ("impermanent") villages (cf. Liljeblad 1957). The Shoshoni in these

villages emphasized the exploitation of riverine food resources. Figure 4 (from Butler 1978:Figure 24) locates some of the Shoshoni villages reported by Steward in 1938.

The principal controversy is over the origin of the Shoshoni. Most authors note that the Late Archaic material culture in southern Idaho is identical to that of the Great Basin. This similarity has been interpreted by several archaeologists as indicating a recent (ca. A.D. 1000) expansion of Numic-speaking peoples out of the southwestern portion of the Great Basin northward and eastward into southern Idaho (Gunnerson 1962; Madsen 1975). Linguistic evidence has been cited in support of this hypothesis (cf. Jacobsen 1968; Butler 1978:Figure 36). Swanson (1972), however, sees such a hypothesis as contradicting the long-term continuous human occupation of southern Idaho indicated by the early dates of several archaeological sites there. He prefers to view a Shoshoni expansion as originating from the north (i.e., in Idaho) and progressing south and west into the Great Basin. Contradictions to the continuity of the Great Basin's continuity in prehistoric occupation apparently are not considered. Thus, Swanson (1972) would place the Shoshoni in southern Idaho at 5000 B.C., while Gruhn (1961a) sees the Shoshoni as recent immigrants arriving in the area around A.D. 1300 (Pavesic and Meatte 1980:17).

Additional information has resulted in other interpretations. Based on similarities in ceramic assemblages between the two regions, Plew (1979) suggests that southern Idaho was influenced by the Great Salt Lake Fremont culture. Butler (1979, 1981) has pursued this possibility quite vigorously through re-analysis of ceramic and basketry data. The occurrence of Fremont cultural manifestations in southern Idaho presents a different scenario and requires further examination.

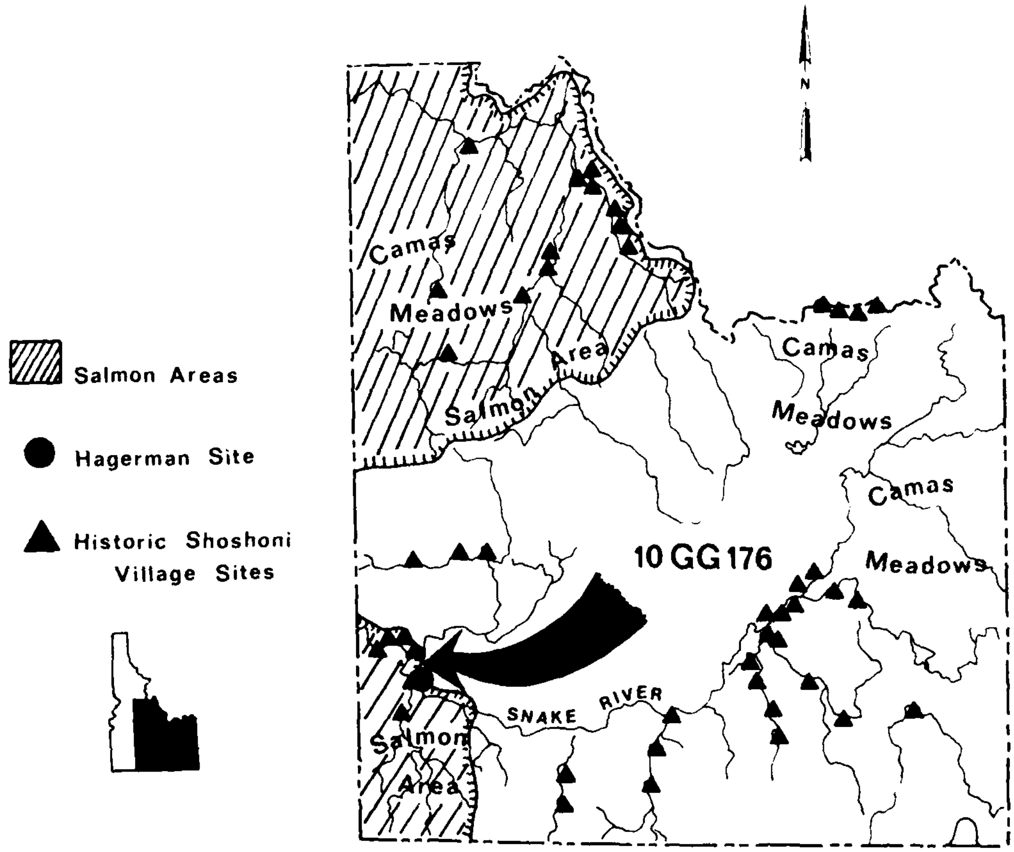


Figure 4. Northern Shoshoni village locations, salmon streams, and camas meadows in the upper Snake and Salmon River country (adapted from Butler 1978:Figure 24).

Butler (1978:69-74) perceived a Late Archaic period extending from ca. A.D. 1200-1800 in southern Idaho. This time frame encompasses Gruhn's (1961a) Dietrich phase (A.D. 1020-1850) at Wilson Butte Cave and Swanson's (1972) Blue Dome (950 B.C.-A.D. 1250) and Lemhi (A.D. 1250-1850) phases at Bison and Veratic rockshelters in Birch Creek valley. The Blue Dome phase (Swanson 1972:200) is characterized by a high frequency of corner-notched points (60%), a lower relative frequency of side-notched points (33%), and minor frequencies of Elko types (4%) and stemmed types (3%). Ground stone slabs and manos, hammerstones, and cobble choppers are also present in Blue Dome assemblages. Ground stone implements are notably absent from the Dietrich phase assemblage, which Gruhn (1961a:143) attributes to differences in local resource exploitation. There are ceramics present at Wilson Butte Cave ("Wilson Butte Plain ware"), but none were found at Bison or Veratic rockshelters. The upper levels of the Dietrich phase at Wilson Butte Cave also contained such perishable artifacts as ". . . sagebrush bark cordage; one-piece wooden arrowshafts; composite arrowshafts with cane mainshafts and wooden foreshafts; composite fire drills; and a leather moccasin" (Butler 1978:14). Dietrich phase projectile points are predominantly small corner-notched types with small side-notched points occurring somewhat less frequently.

Small, triangular, side-notched projectile points are one of the most common material culture traits of Butler's (1978:70) Late Archaic period. They are collectively referred to as "Desert side-notched points (DSN)" (Baumhoff and Byrne 1959) and are found throughout the Desert West after A.D. 1100-1200 (Hester 1973). The Lemhi phase of Swanson (1972) is dominated by Desert side-notched points, while Cottonwood (or "Beaverhead")

triangular points are the next most common (Butler 1981:10). Both kinds of points occur in Fremont deposits in Utah, but the Desert side-notched points ". . . are characteristic of the Shoshonean deposits there" (Butler 1981:10). The European trade beads commonly found in the Lemhi phase deposits in Birch Creek valley are from the mid-1800s (Butler 1981:10-11).

Swanson (1972) would attribute all of the Blue Dome, Dietrich, and Lemhi phase materials in southern Idaho to the Shoshoni and their indigenous ancestors. However, Butler's (1979, 1981) reassessment of the archaeological data strongly suggests that the typical Shoshonean ceramics and basketry are not in fact Shoshonean at all, but Fremont. Butler (1981) also re-evaluated the radiocarbon dates and stratigraphic data from several critical sites in southern Idaho. Butler would date the beginning of the Dietrich phase to ca. A.D. 300-500 and its termination to ". . . possibly as late as A.D. 1600-1700" (Butler 1981:15; also cf. Wright 1978:126). The early portion of the Blue Dome phase, according to Butler (1981:12), is

> . . . generally coincident with the beginnings of both the Late Prehistoric period on the High Plains (Frison 1978:69) and the Great Salt Lake variant of Fremont culture in northern Utah (Jennings 1978:162).

Butler (1981:12) also notes that at this time the change in projectile point types and sizes is believed to mark the introduction of the bow and arrow on the High Plains. The first pottery also appears on the High Plains at this time.

Butler's (1981:11, 15) assessment of Swanson's (1972) Lemhi phase is that, based on the European trade beads in the Lemhi deposits, it could not have begun before A.D. 1800. Butler (1981:15) further states

> It is the only phase that can be attributed to the Northern Shoshoni in Birch Creek Valley. The preceding Blue Dome phase may represent either an intrusion of Late Prehistoric Plains peoples into eastern Idaho or a little known aspect of the Great Salt Lake variant of Fremont culture in southern Idaho (or some combination of the two) (Butler 1981:15).

Butler's (1981:4) point of view with respect to the appearance of the Shoshoni in southern Idaho is clearly stated here:

> There is no evidence that the Northern Shoshoni had penetrated the Northern Rocky Mountains before the start of the 18th century or that they were in southern Idaho generally much before the middle of the 16th century. On the other hand, there is evidence of the persistence of the Fremont culture in southern Idaho through at least the early part of the 16th century and of High Plains hunting groups on the borders of the region as early as A.D. 500, some of whom may have penetrated the Rocky Mountains of eastern Idaho or were in contact with the Fremont peoples of the Northeastern Great Basin from that time onward.

Based upon the work of Pavesic and Meatte (1980) at 10GG176, the occupation of the site falls into Butler's (1979, 1981) late Middle Archaic and Late Archaic periods. This places the cultural affiliation of the occupation(s) of 10GG176 within the controversy over the time of the appearance of the Shoshoni in the area.

In 1978, Butler pointed out a serious data gap that may be hiding information that could help resolve much of the controversy. In discussing the types and distribution of archaeological sites in the Upper Snake and Salmon River country, Butler (1978:57) makes these comments:

> Housepits, circular depressions excavated in the earth over which a conical roof was constructed, have been found mainly along the Salmon River and its principal tributaries, especially the Middle Fork of the Salmon. None of these have been excavated in detail; they represent an aspect of life in the Upper Snake and Salmon River Country which is totally unknown.

Ethnohistory

Regardless of when the Shoshoni arrived, by the early 1800s the aboriginal inhabitants of south-central Idaho were Numic speakers. Northern Paiute occupied the western and northern portions of the Great Basin while the Shoshoni were in the central and eastern portions (Goss 1972:57). In southern Idaho, there was a considerable overlap in the areas of settlement of these groups.

The Idaho Historical Society (1970:4) recognizes three groups of Shoshoni and two groups of Northern Paiute in the region. The Shoshoni groups are defined largely by geographical location. For example, there are a "Northern and Eastern" group and a "Western and Southern" group, but Shoshoni villages occur throughout south-central Idaho. Villages were particularly dense just below Shoshoni Falls and above American Falls on the Snake River, and several villages were located within Hagerman valley at or near Salmon Falls (Gilbert and Evermann 1894:26; Steward 1938:165-166).

These villages apparently were fishing locations. Early explorers reported the presence of ". . . 100 lodges . . . busily occupied in killing and drying fish . . ." at the Salmon Falls locale in 1820 (Spaulding 1953:84). Other explorers also indicated that the Salmon Falls area was an important location for the inhabitants of the region. John Charles Fremont visited Lower Salmon Falls in 1843 to purchase food from the local people and noted that the principal element of their subsistence economy was the salmon runs (Egan 1977:161). In addition to salmon, the Shoshoni of Hagerman valley, like their Paiute neighbors, also exploited a large variety of tubers, roots, grasses, and berries (Steward 1938:18). Camas (<u>Camassia quamash</u>) root was exploited particularly heavily by Shoshoni groups; it grew

abundantly in an upland area, Camas Prairie, between the central Idaho highlands and the Snake River Plain north of 10GG176. Bighorn sheep (Ovis canadensis), mule deer (Odocoileus hemionus), antelope (Antilocapra americana), and occasionally bison (Bison bison) were also utilized ethnohistorically by the Shoshoni. However, rabbits, particularly jackrabbits (Lepus californicus), were the most actively exploited animals. Hunting small animals was usually done by single family units, while cooperative hunting by several family units was used for larger game or for large rabbit drives.

The appearance of the horse among the Shoshoni and other Idaho Indians must have changed the subsistence and cultural patterns of these people significantly. Horses gave the Shoshoni people greater mobility, permitting them to hunt and gather over a wider area than previously possible. Exploitation of a greater number of resources and the transportation of these resources were facilitated by the horse (Liljeblad 1957:40). Murphy and Murphy (1960 in Butler 1978:46) divide the recent history of the Northern Shoshoni into six periods, including:

> (2) An early equestrian period, ca. A.D. 1700-1750, which saw horse-mounted Shoshonean-speaking peoples expand well out onto the High Plains; however, many Shoshoni remained on foot in their home territory;
>
> (3) The period of an hypothesized general retreat of horse-mounted Shoshoni from the northern Plains back across the Continental Divide, ca. 1750-1810, due to pressure from Northern Plains tribes, such as the Blackfoot, who had now acquired both horses and firearms . . . .

The great bison herds that lived in the plains east of the Rocky Mountains became accessible, and the Fort Hall Bannock and Shoshoni used horses to travel and to obtain buffalo meat and hides. These trips resulted in the adoption of many Plains Indian paraphernalia and customs. The skin tent,

travois, some symbols, and other cultural traits were adopted if they proved to be useful. By A.D. 1800 much of the earlier Shoshoni pattern had changed, and the first Euroamericans to meet these people saw a different set of subsistence and economic patterns than is revealed by the archaeological record.

Euroamerican History

The first Euroamericans to explore south-central Idaho were engaged in the fur trade. Several companies explored and trapped fur-bearing animals along the Snake River and its tributary streams. These included John Jacob Astor's Pacific Fur Company (1811-1812), the North West Company (1818-1821), the Hudson's Bay Company (1821-1856), and numerous American-based companies (Beal and Wells 1959:60-195). These early explorers and trappers were followed by missionaries, emigrants, gold miners, and eventually by livestock ranchers.

Under Commanders Ramsay Crooks and Wilson Price Hunt, the Astorians explored both the north and south sides of the Snake River as far as Glenn's Ferry, a few miles east of Hagerman. Crooks' group crossed to the north side of the river and proceeded north, while Hunt's group followed the Boise River. In 1812 Robert Steward returned eastward with news of the interior. He used the southern route pioneered by Crooks--a route that was used continuously for over 50 years and eventually became part of the Oregon Trail.

Donald McKenzie was in charge of the early British efforts to exploit the area along the Boise, Payette, and Owyhee rivers between 1818 and 1820 (Beal and Wells 1959:109-120). In 1824 and again in 1826, Alexander Ross traveled up the Snake River and camped and trapped for extended periods at Salmon Falls and in Hagerman valley. He chose to travel on the south bank

(i.e., opposite 10GG176), as did many of the emigrants that followed between 1840 and 1860.

Among the first missionaries to travel through the Hagerman valley were Marcus Whitman and H. H. Spaulding on their way to Fort Boise by cart in 1836 (Wells 1977:17). The Oregon Trail was surveyed by John Charles Fremont in 1842-1843, and by 1863 more than 45,000 emigrants had used the trail (Haines 1973; Meacham 1979:5). After 1862, gold miners made much use of the trail when gold was discovered in the Boise basin. This rapid influx of new people resulted in the permanent settlement of the region and the development of interconnecting roads with the Union Pacific Railroad in Kelton, Utah (Meacham 1979:41). Stage lines began to operate on portions of the Oregon Trail as well as on new roads, such as the Kelton Road, which passed through the Hagerman valley to what is now Twin Falls.

Ranching had already begun in south-central Idaho with herds from Texas driven along local portions of the Oregon Trail (Hanley and Lucia 1975:82), but it did not become very profitable until the arrival of the railroad in 1885. The Union Pacific's Oregon Short Line connected Promontory, Utah, with Umatilla, Oregon (Bilger 1969:13-14), although it by-passed Boise, the most important settlement of the time.

The arrival of the railroad marks the end of the early historic period in the area. Today the primary use of the land is for ranching and truck gardening, and melons, vegetables, and apples are the main crops. With the construction of the Lower Salmon Falls Dam in 1943 by the Idaho Power Company, many of the local historic and prehistoric archaeological sites were inundated. Those that remain are largely confined to adjacent creeks, springs, and isolated locations immediately below the dam.

PART II

ENVIRONMENTAL VARIABLES

It is unnecessary here to repeat the thorough descriptions of the environmental variables of the Snake River Plain that may be found elsewhere (Butler 1978; Pavesic and Meatte 1980; Lothson and Virga 1981). However, these variables are highlighted to provide the environmental context in which the site may be viewed (Figures 5-7).

Geology

The study area is located on a terrace remnant on the north side of the Snake River where the Snake crosses the physiographic province known as the Snake River Plain (Butler 1978:22; McKee 1972). The extreme eastern end of the Plain lies at over 1829 m (6000 ft) above sea level, while the western end is at 915 m (3000 ft). It is an area of low relief underlain everywhere by Miocene and younger basalts. Evidence of volcanism is common in the form of ". . . hundreds of extinct volcanic craters and cones and collapsed lava blisters and tubes" (Butler 1978:23). There is a slightly elevated volcanic ridge approximating the Plain's central east-west axis. Volcanic activity along this ridge probably is responsible for the diversion of the Snake River to its present course along the southern edge of the Plain (Butler 1978:23).

Figure 5. Area V, view to the east.

Figure 6. Area IX, view to the north.

Figure 7. Area X, view to the west.

Toward the western end of the Plain, 10GG176 is situated at the base of a series of basalt cliffs that rise to approximately 920 m (3020 ft). Most of the site itself lies behind dunes at 902-905 m (2960-2970 ft) on the terrace edge. The river is approximately 1 km (0.6 mi) to the south and west and some 55 m (175 ft) below.

Riley Springs issues from the base of the basalt cliffs and serves the hatchery complex. As part of the "Thousand Springs" group (Stearns et al. 1938:162), Riley Springs derives its water from one of the world's most productive aquifers. This aquifer is fed in part by five "lost rivers" that disappear into sinks along the north edge of the Snake River Plain. The water flows in subterranean channels and through an upper permeable basalt that is of Pleistocene age, but cannot penetrate the lower Banbury basalt. Numerous springs are found on the north side of the Snake River valley downstream from Twin Falls; these would have been good site locations for prehistoric peoples because they would have provided sources of fresh water and attracted animals.

Catastrophic flooding during the Late Pleistocene is another factor to be considered. Glacial Lake Bonneville of Utah and southeastern Idaho rapidly drained through Red Rock Pass and some 380 cubic miles of water flooded the Snake River Plain (Pavesic and Meatte 1980:7). Morrison and Frye (1965) place the last flooding of the Snake River Plain between 12,500 and 14,500 B.P. which probably predates the Spokane Flood of 13,000 B.P. on the Columbia River (Webster et al. 1976). Additional detail on the Snake River flooding is provided by Pavesic and Meatte (1980:7):

> The Thousand Springs section of the Snake River canyon played an important role during the flood, as this part of the canyon acted as a constriction which regulated the amount of water delivered downstream. The

> floodwaters doubled the width of the canyon and the water rose to an estimated 240 feet above the Snake River with a discharge capacity of 33 million cubic feet per second . . . . Once the floodwaters gushed through the Thousand Springs restriction, a tremendous volume of water and debris was dumped into the Hagerman Valley. The valley acted as a massive sediment trap and "more than 7 billion cubic feet of Melon Gravel (one-twentieth of a cubic mile)" was deposited . . . . The exact terrace location where site 10-GG-176 is located was spared the gravel inundation, although it occurred across the river from the site and approximately a mile and a quarter to the north.

When the flood waters receded, gravel, sands, and eventually silts were left behind. Deposits accumulated in low areas of the valley floor and downstream from resistant ridges of bedrock. These deposits have been worked and reworked by water and wind, creating dune and dune-like features between exposed ridges of bedrock. Talus slopes washed away by flood waters were then re-established by continued weathering. The general physiographic character of the area probably was established by approximately 8000 B.P. (cf. Morrison and Frye 1965).

The soils in southern Idaho are generally Aridisols. Pavesic and Meatte (1980:9) presume two Aridisol subgroups, Xerollic Camborthids and Xerollic Haplargids, to predominate in the Hagerman valley. The soils at 10GG176 appear to have developed in reworked overbank sediments originally deposited by relatively slow-moving waters, probably from Riley Creek. The materials are well-sorted and single-grained with very little calcium carbonate cementation. The soils do not have a well-developed ped structure and there is a definite cambic (altered) horizon. Due to the vegetation supported by water from Riley Creek and to the landscaping at the hatchery complex, the upper portions of these loamy sand/sandy loam sediments contain considerable organic material. Silty sand and basalt gravel that constitute

Late Pleistocene and Recent alluvium underlie these poorly developed soils. Profile drawings and detailed descriptions of the sediments at 10GG176 may be found in Pavesic and Meatte (1980) and Lothson and Virga (1981), as well as in the appendices of this report.

Flora

The Snake River Plain is within the general vegetation zone and habitat type defined by the association of *Artemisia tridentata* (big sagebrush) and *Agropyron spicatum* (bluebunch wheatgrass) as discussed by Daubenmire (1970) and Franklin and Dyrness (1973). However, the vegetation local to 10GG176 is much different from the surrounding steppe-like vegetation communities found above the rim of the Snake River valley. The difference in vegetation results from microenvironmental variables peculiar to the site location. For instance, Riley Springs and Riley Creek support riparian vegetation that includes *Typha latifolia* (broad-leaved cattail) and *Salix* spp. (willow). Temperatures also may be slightly warmer below the rims of the basalt cliffs to the benefit of such species. The Snake River itself supports riparian vegetation. Dense brush follows creeks and streams in the area, especially where they are fed by spring water. *Artemisia tridentata* grows in deep loamy soil between ridges and on wide floodplains. More xeric species such as *Artemisia rigida* (stiff sagebrush), *Poa sandbergii* (Sandberg's bluegrass), and *Bromus tectorum* (cheatgrass brome) grow on stoney ridges. Cheatgrass brome is of European origin and often replaces bluebunch wheatgrass in overgrazed areas.

Fauna

A variety of faunal species has been noted to inhabit south-central Idaho in recent times (Larrison 1976:222-226). Many of these species may well have been available prehistorically for exploitation by aboriginal human inhabitants of the region. These species are characteristic of both the Snake River drainage and the northern Great Basin and include mammals, birds, fish, and mollusks.

Some of the more common mammals in the region are *Brachylagus idahoensis* (pygmy rabbit), *Sylvilagus nuttalli* (cottontail rabbit), *Lepus californicus* (black-tailed jackrabbit), *Taxidea taxus* (badger), and *Antelocapra americana* (antelope). Depending upon locally available cover, water, and food, *Odocoileus hemionus* (mule deer) and *Canis latrans* (coyote) also may be found.

Birds are abundant and diverse, especially around the Snake River (Larrison et al. 1967:34-36). Nonaquatic species include *Zenaidura macroura* (mourning dove), *Centrocercus urophasianus* (sage grouse), and *Pediocetes phasianellus* (sharp-tailed grouse). At peak migration periods, waterfowl are numerous, and *Anas platyrhynchos* (mallard) and *Branta canadensis* (Canadian goose) nest locally.

Site 10GG176 is located near the upstream limit of the Snake River anadromous fish migrations. *Oncorhynchus nerka* (sockeye salmon), *O. tschawytscha* (chinook salmon), and *Salmo gairdneri* (steelhead trout) are important species that came up the Snake River (Simpson and Wallace 1978:55-103). Moe et al. (1980:12) add the following information:

> Gilbert and Evermann (1894:26) observed large numbers of salmon trying to ascend Lower Salmon Falls near Hagerman and noted the importance of this resource to the native and Euroamerican populations of this region, but

> extensive damming of the Snake River has adversely affected the salmon runs in the last century. Sturgeon (Acipenser transmontanus) are still numerous in the middle Snake River, though the dams have restricted their movements and a dramatic decrease in average fish size has been recorded (Coon 1979:17-21). The Snake also contains populations of various native nonmigratory fish, including whitefish (Prosopium williamsoni), squawfish (Ptychocheilus oregonensis), and cutthroat trout (Salmo clarki . . .).

The Lower Salmon Falls may have been an important prehistoric fishing area as several sites have been reported at and near the dam location (Moe et al. 1980:36).

Fresh water mollusks were also exploited in the area and some appear in the collections from 10GG176. Gruhn (1964) identified Gonoidea angulata at two sites, although Moe et al. (1980:12) suggest that Margaritifera margaritifera is a more likely species to have been exploited (cf. also Lyman 1980).

Climate and Paleoclimates

The present climate of the Hagerman area is described in Pavesic and Meatte (1980) and in Lothson and Virga (1981). Very briefly, the Snake River valley is surrounded by an arid steppe having an average annual precipitation of less than 230 mm (9 in). The prevailing Pacific westerlies are moisture-bearing through June, but precipitation becomes nearly nonexistent in July and August. High winds and lightning are common in summer months, and the average maximum daily temperature reaches 34° C (93° F) in July. The coldest winter average daily temperature occurs in January at -8° C (18° F). Temperatures at lower elevations in the Snake River valley commonly are warmer by 3-6° C (5-10° F). Thus, summers are hot and winters are cold in

this generally dry area, and there is a large proportion of sunny days. Dust and sand storms are common, especially in late spring and early summer (cf. also Young et al. 1929).

Past climatic conditions probably were not always the same as they are today. If conditions changed significantly, then vegetation communities and fauna would have undergone concomitant changes affecting the exploitable resource base for human occupants of the region. A broad scheme of paleoclimatic changes has been presented by Antevs (1948, 1953, 1955) and applied to North America. In general he sees three periods: 1) the Anathermal from 10,000-7500 B.P. when it was much cooler and moister than today; 2) the Altithermal from 7500-4500 B.P. when it was much warmer and drier than today; and 3) the Medithermal, essentially the present climate (slightly cooler and moister than the Altithermal), which was in effect by 4500 B.P. It is reasonable to expect regional variation in such a broad scheme. Pollen spectra from Swan Lake in southeastern Idaho (Bright 1966) show the presence of most modern plant species by approximately 8000 B.P., with a possibility of cooler, moister conditions from 3100-1700 B.P. Mehringer et al. (1977) have identified a warming trend at Lost Trail Pass in Montana between 7000 and 5000 B.P. which is very similar to Antevs' Altithermal period.

By way of contrast, Butler (1978) prefers to view paleoclimatic conditions on the Snake River Plain as a gradual but continuous post-glacial trend to warmer and drier conditions. He envisions nine periods based on faunal materials, especially dry- versus wet-adapted rodents, from deposits in sites in southern Idaho. Butler's scheme begins 5000 years earlier than Antevs' and considers that some Late Pleistocene fauna (e.g., horse, camel, mammoth) were extinct by approximately 10,000 B.P. In this continuous

warming trend, however, Butler recognizes "cold pulses" which seem to be most common in the time-frame of Antevs' Anathermal period. Butler sees the Holocene as beginning around 7200 B.P., or some 3000 years later than Antevs places it, and considers 3800 B.P. as the apex of warm, dry conditions, with three subtly different paleoclimatic periods between 3800 B.P. and the present.

Based on previous work at 10GG176, the cultural material there probably is no older than 2800 B.P. This post-dates the beginning of essentially modern climatic conditions under either paleoclimatic model. Sediments deposited from an increased flow of Riley Creek would indicate deposition in relatively moist (and cool) conditions. Such conditions could pre-date human occupation at 10GG176 by many millenia, or they could have been in effect from 4500-2800 B.P., and perhaps as late as 650 B.P. to the present, or all three, depending upon which paleoclimatic model one chooses to employ.

PART III

METHODOLOGY

As a result of redesigning the construction plans to expand the hatchery facilities, it was necessary to test five areas of impact for archaeological resources (shaded in Figures 8 and 9). The purposes of investigations were to identify the cultural resources in these areas, to assess their significance and the affects of their total or partial loss during construction, and to recommend appropriate measures for mitigation for those cultural resources considered to be significant. The redesigned construction plans were developed specifically to avoid most of the known cultural resources at 10GG176, which had had eight archaeological research areas designated during two previous seasons of fieldwork.

Field Methods

All five areas will be affected by pipeline construction. Area V will be crossed by new pipelines along the eastern boundaries, presumably away from the housepit features identified by Pavesic and Meatte (1980), and 55 new 1 x 1 m test units were excavated (Table 1; Figure 10). Thirty-two test units were excavated in area VI in addition to the four units excavated during the second phase in 1980 (Table 1; Figure 11). Previous excavations in Area VII had shown it to contain minimal cultural materials and no further testing was done there. Twenty test units were excavated in Area VIII in 1980 (Lothson and Virga 1981) and 16 additional units were excavated in

Key to Figures 3 and 9*

STRUCTURES

FISH RACEWAYS

ASPHALT ROADWAYS

GRAVEL ROAD

CONSTRUCTION ZONE

SWAMP AND LOWLAND AREAS

UNTESTED AREAS 1982

TREES

RILEY CREEK

WIRE

PIPE LINE ROUTES

*Contour intervals are 2 ft.

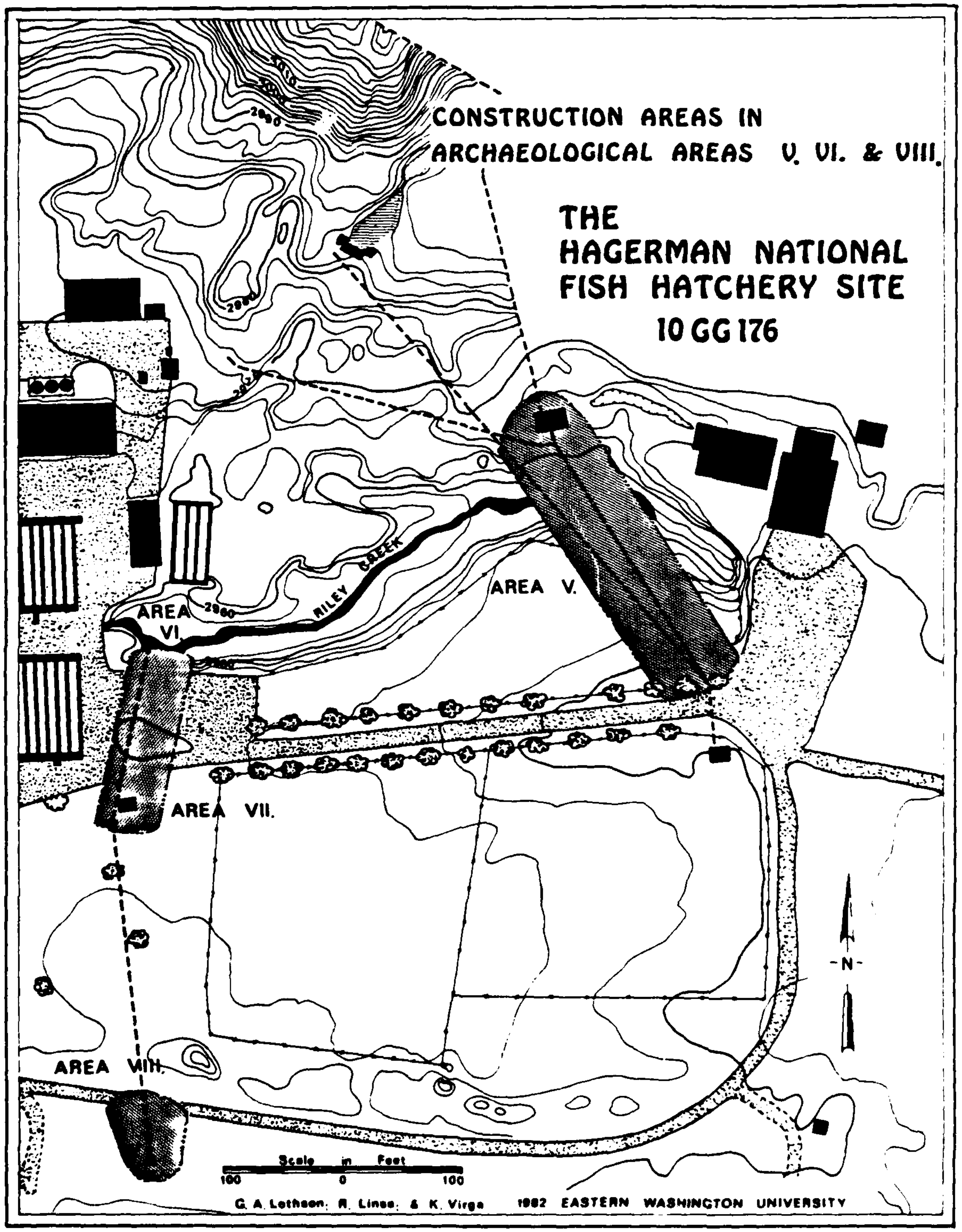


Figure 8. Pipeline construction plans for Areas V, VI, and VIII.

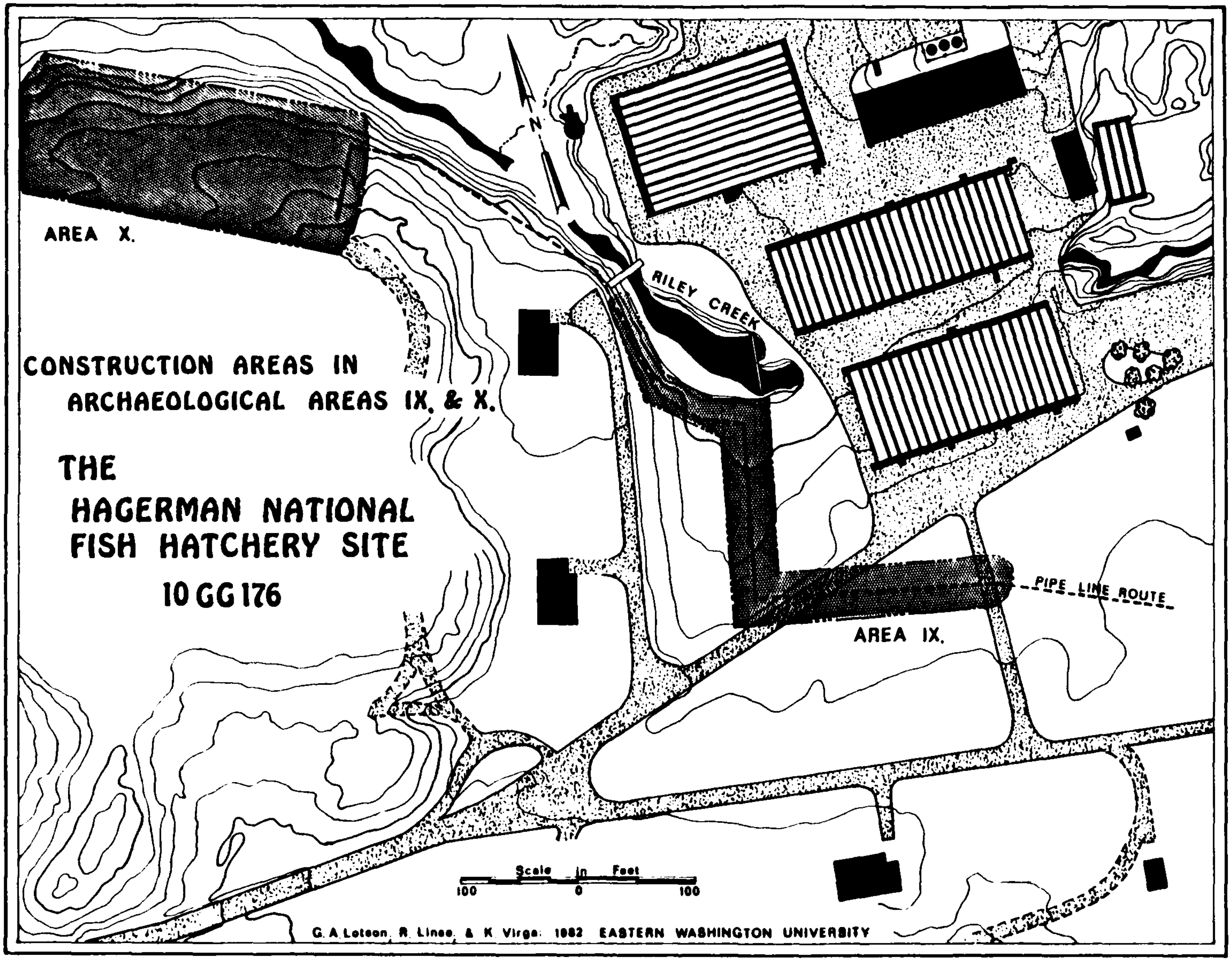


Figure 9. Pipeline construction and settling pond plans for Areas IX and X.

Table 1. Provenience of 1 x 1 m Test Units at 10GG176.

Unit	Provenience	Unit	Provenience
	Area V		
X-1001	31-32N/162-163E	X-1029	45-46N/142-143E
X-1002	30-31N/162-163E	X-1030	46-47N/142-143E
X-1003	33-34N/162-163E	X-1031	48-49N/142-143E
X-1004	34-35N/162-163E	X-1032	49-50N/142-143E
X-1005	35-36N/157-158E	X-1033	51-52N/142-143E
X-1006	36-37N/157-158E	X-1034	51-52N/142-143E
X-1007	38-39N/157-158E	X-1035	54-55N/142-143E
X-1008	39-40N/157-158E	X-1036	55-56N/142-143E
X-1009	41-42N/157-158E	X-1037	60-61N/147-148E
X-1010	42-43N/157-158E	X-1038	59-60N/147-148E
X-1011	38-39N/152-153E	X-1039	57-58N/142-143E
X-1012	39-40N/152-153E	X-1040	58-59N/142-143E
X-1013	41-42N/152-153E	X-1041	50-51N/137-138E
X-1014	42-43N/152-153E	X-1042	51-52N/137-138E
X-1015	44-45N/152-153E	X-1043	53-54N/137-138E
X-1016	45-46N/152-153E	X-1044	54-55N/137-138E
X-1017	47-48N/152-153E	X-1045	56-57N/137-138E
X-1018	48-49N/152-153E	X-1046	57-58N/137-138E
X-1019	36-37N/162-163E	X-1047	50-51N/157-158E
X-1020	37-38N/162-163E	X-1048	51-52N/157-158E
X-1021	42-43N/147-148E	X-1049	48-49N/162-163E
X-1022	43-44N/147-148E	X-1050	49-50N/162-163E
X-1023	45-46N/147-148E	X-1051	57-58N/132-133E
X-1024	46-47N/147-148E	X-1052	58-59N/132-133E
X-1025	48-49N/147-148E	X-1053	60-61N/132-133E
X-1026	49-50N/147-148E	X-1054	61-62N/132-133E
X-1027	51-52N/147-148E	X-1057	59-60N/132-133E
X-1028	52-53N/147-148E		

Table 1. (Continued)

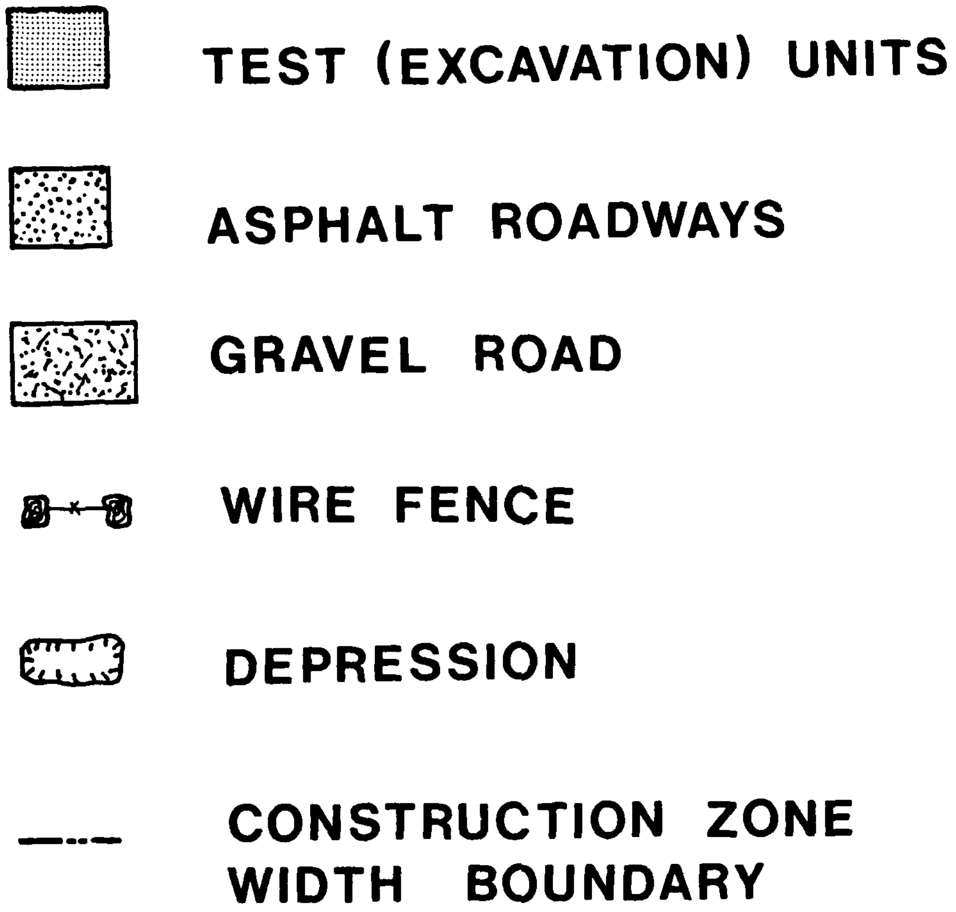
Unit	Provenience	Unit	Provenience
	Area VI		
X-1	22-23N/14-15E*	X-491	23-24N/24-25E
X-2	23-24N/14-15E*	X-492	23-24N/23-24E
X-3	38-39N/30-31E*	X-500	20-21N/24-25E
X-4	39-40N/30-31E*	X-501	21-22N/24-25E
X-406	24-25N/16-17E	X-503	24-25N/24-25E
X-407	23-24N/16-17E	X-504	24-25N/23-24E
X-419	23-24N/17-18E	X-537	20-21N/28-27E
X-420	24-25N/17-16E	X-538	21-22N/27-28E
X-428	20-21N/18-19E	X-549	20-21N/28-29E
X-429	21-22N/18-19E	X-550	21-22N/28-29E
X-440	20-21N/19-20E	X-593	38-39N/28-29E
X-441	21-22N/19-20E	X-594	39-40N/28-29E
X-456	24-25N/20-21E	X-607	38-39N/27-28E
X-457	25-26N/20-21E	X-608	39-40N/27-28E
X-468	24-25N/21-22E	X-649	38-39N/24-25E
X-469	25-26N/22-22E	X-650	39-40N/24-25E
X-488	20-21N/23-24E	X-663	38-39N/23-24E
X-489	21-22N/23-24E	X-664	40-39N/23-24E
	Area VIII		
X-101	91-92S/52-53E*	X-119	109-110S/62-63E*
X-102	90-91S/52-52E*	X-120	108-109S/62-63E*
X-103	84-85S/30-31E*	X-130	82-83S/10-11E
X-104	83-84S/30-31E*	X-131	83-84S/10-11E
X-105	82-83S/14-15E*	X-144	83-84S/11-12E
X-106	83-84S/14-15E*	X-145	82-83S/11-12E
X-107	104-105S/4-5W*	X-182	77-78S/13-14E
X-108	103-104S/4-5W*	X-183	78-79S/13-14E
X-109	99-100S/5-6E*	X-190	77-78S/14-15E
X-110	98-99S/5-6E*	X-191	78-79S/14-15E
X-111	93-94S/15-16E*	X-225	82-83S/16-17E
X-112	92-93S/15-16E*	X-226	83-84S/16-17E
X-113	101-102S/25-26E*	X-239	83-84S/17-18E

Table 1. (Continued)

Unit	Provenience	Unit	Provenience
	Area VIII (Continued)		
X-114	100-101S/25-26E*	X-240	82-83S/17-18E
X-115	96-97S/37-38E*	X-327	78-79S/9-10E
X-116	95-96/37-38E*	X-328	77-78S/9-10E
X-117	111-112S/15-16E*	X-335	77-78S/8-9E
X-118	110-111S/15-16E*	X-336	78-79S/8-9E
	Area IX		
X-2000	44-45N/63-64W	X-2008	37-38N/75-76W
X-2001	44-45N/62-63W	X-2009	38-39N/75-76W
X-2002	9-10N/61-62W	X-2010	45-46N/77-78W
X-2003	9-10N/62-63W	X-2011	45-46N/78-79W
X-2004	10-11N/72-73W	X-2012	49-50N/86-87E
X-2005	10-11N/73-74W	X-2013	49-50N/87-88E
X-2006	21-22N/75-76W	X-2014	ØN-1S/37-38W
X-2007	22-23N/75-76W	X-2015	ØN-
	Area X		
X-3000	19-20N/5-6E	X-3010	9-10S/24-25W
X-3001	20-21N/5-6E	X-3011	10-11S/24-25W
X-3002	ØN-1S/11-12E	X-3012	10-11S/5-6E
X-3003	1-2S/11-12E	X-3013	9-10S/5-6E
X-3004	Ø-1N/7-8W	X-3014	23-24N/15-16E
X-3005	1-2N/7-8W	X-3015	24-25N/15-16E
X-3006	Ø-1N/41-42W	X-3016	26-27N/35-36W
X-3007	1-2N/41-42W	X-3017	27-28N/35-36W
X-3008	9-10S/50-51W	X-3018	1S-Ø/45-46E
X-3009	10-11S/50-51W	X-3019	1-2S/45-46E

*Tested during the 1980 field season

Key to Figures 10 through 14*



*Contour intervals are 10 cm for Figures 10 through 13 and 20 cm for Figure 14.

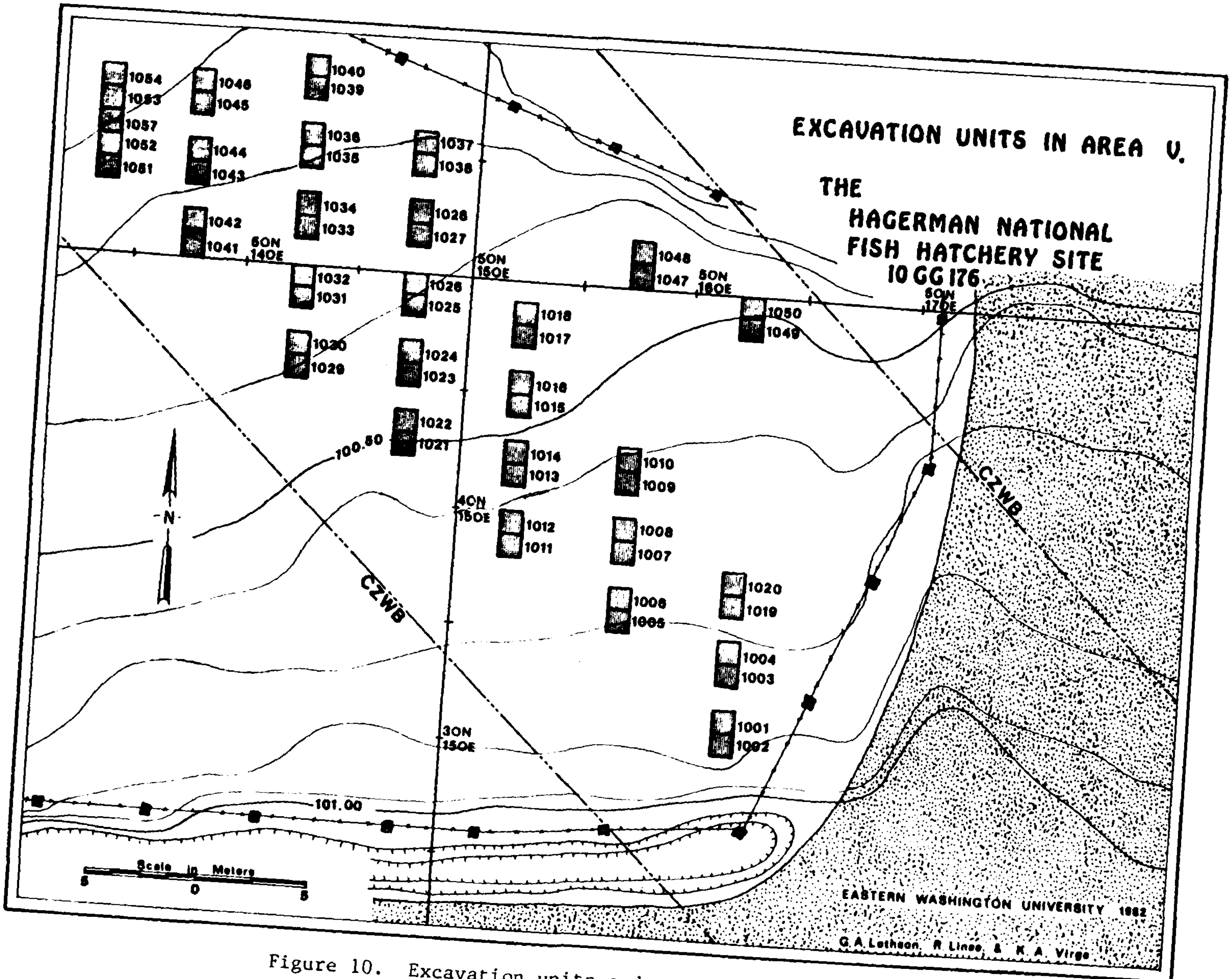


Figure 10. Excavation units and contour map of Area V.

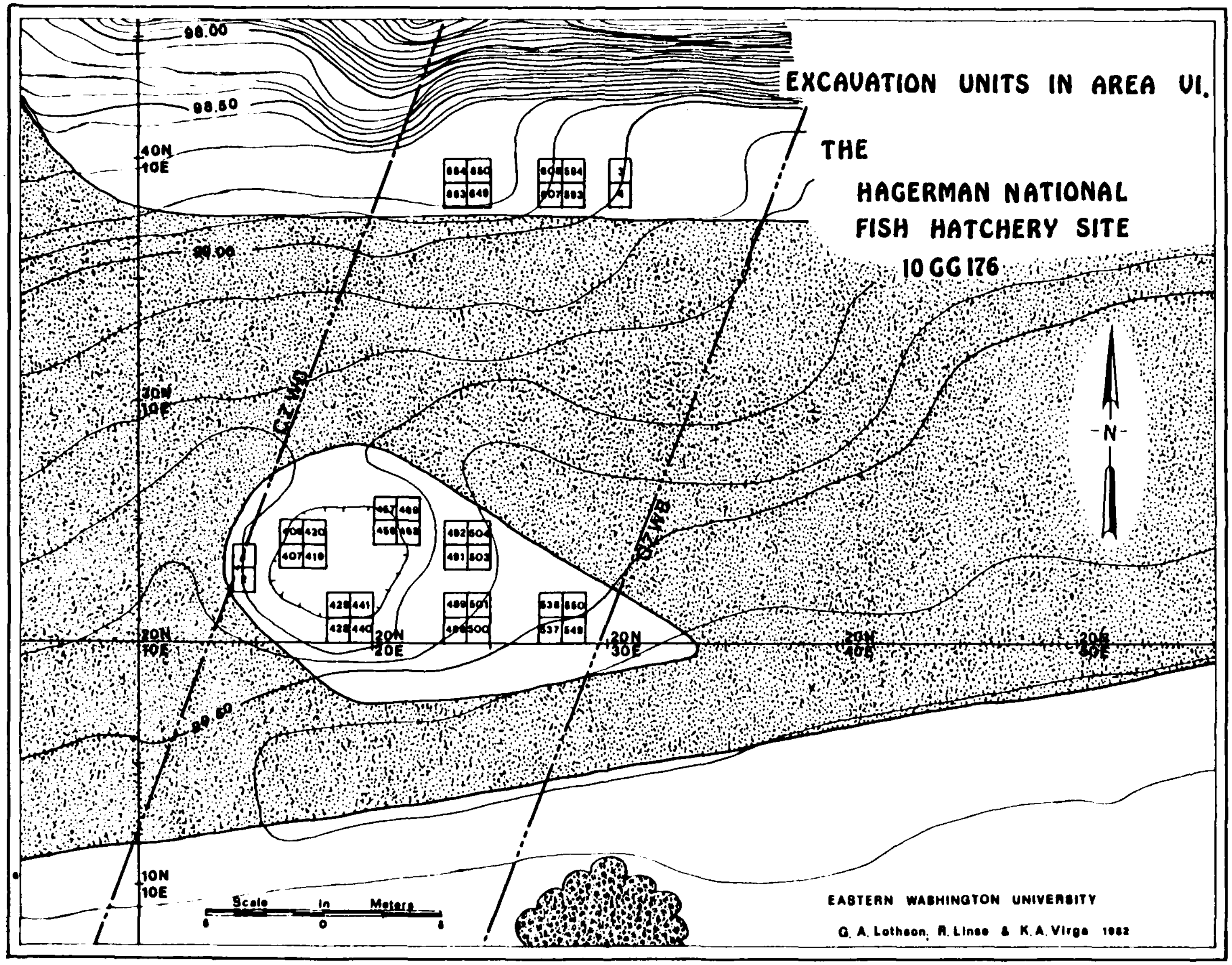


Figure 11. Excavation units and contour map of Area VI.

1981 (Table 1; Figure 12). Area IX is a new area and 16 test units were placed there (Table 1; Figure 13). Area X is also a new area designation and corresponds to the proposed location of a settling pond west of the present hatchery complex. Twenty test units were placed in Area X (Table 1; Figure 14).

Considered in this report are 139 test units (1 x 1 m) excavated in 1981. For analytical purposes, materials from 24 additional test units (four from Area VI and 20 from Area VIII) excavated in 1980 are also included (Table 1), for a total of 163 units. For ease of excavation, each test unit was placed contiguous to at least one other test unit to form a minimum unit 1 x 2 m in size. Several other units were 2 x 2 m and one was 1 x 5 m. The sampling strategy was judgmental and test unit locations were chosen in consultation with LeRoy Allen, Archaeological Coordinator for the U.S. Army Corps of Engineers, and Tom Green, Idaho State Archaeologist.

Test units were excavated in arbitrary 10 cm levels by shovel skimming and troweling. All excavated soil matrix was passed through 6 mm (1/4-in) mesh hardware cloth. Recovered cultural material was bagged and labeled by level, test unit, and area, and prepared for transport to laboratory facilities in Cheney. Matrix from features was to have been screened through a finer mesh, but no features were found. Test units were excavated to a depth of 1.0 m or until bedrock was met. Auger tests were done in the bottoms of many of the test units to assure that deeper sediments were sterile of cultural material. Additional auger tests were done from the surface between test units to locate any cultural material concentrations that may have been missed in placing the test units. A total of 117 auger tests were dug.

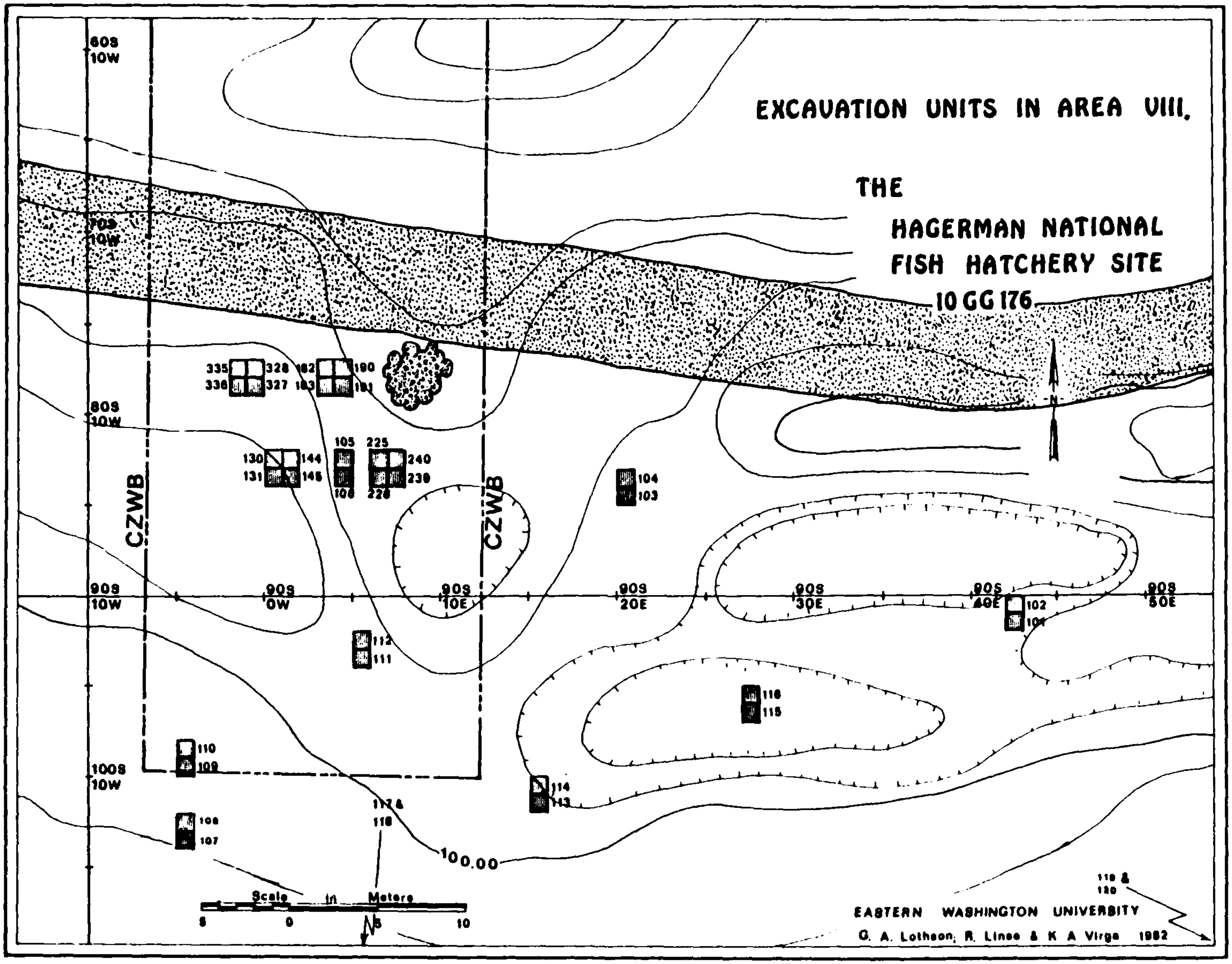


Figure 12. Excavation units and contour map of Area VIII.

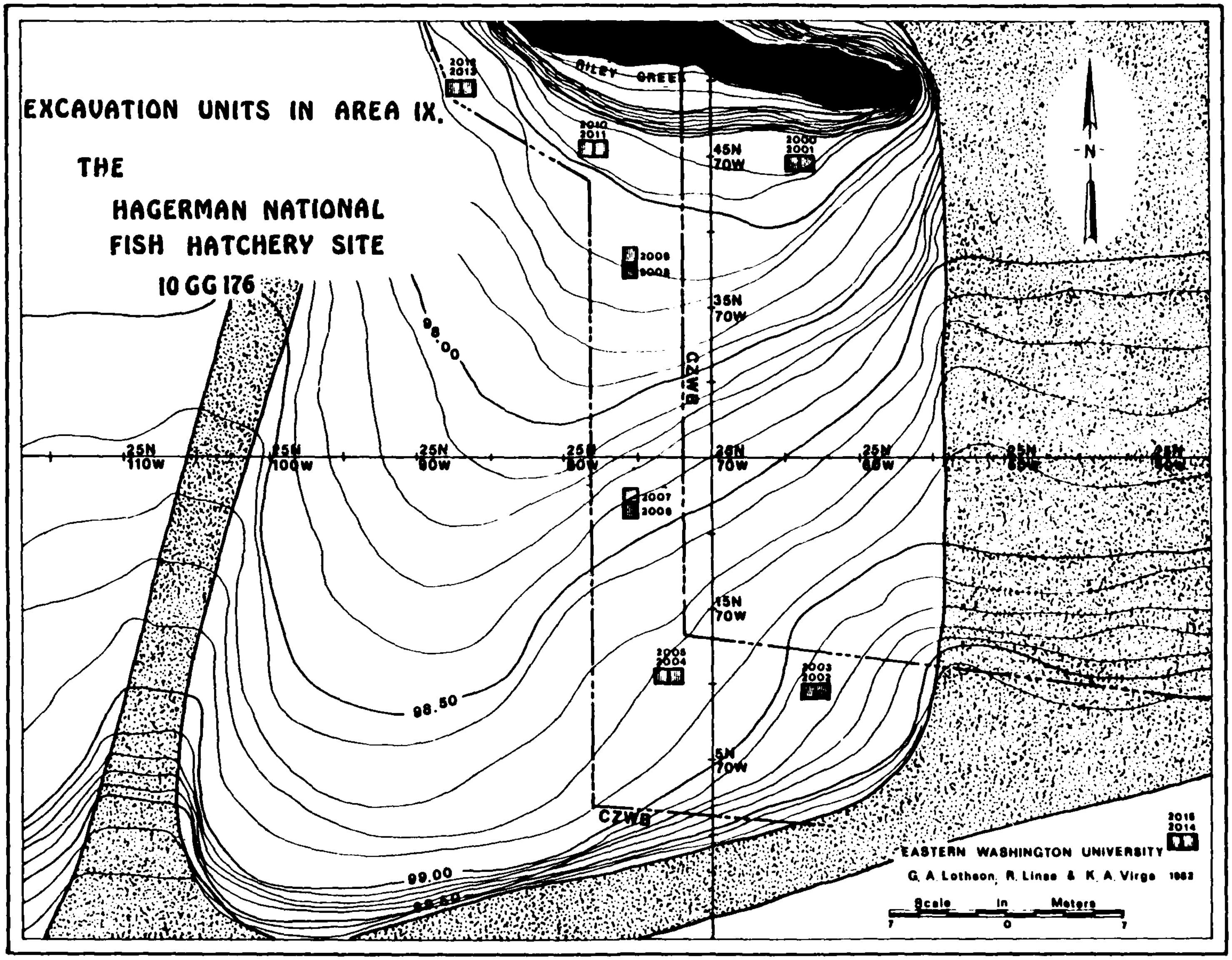


Figure 13. Excavation units and contour map of Area IX.

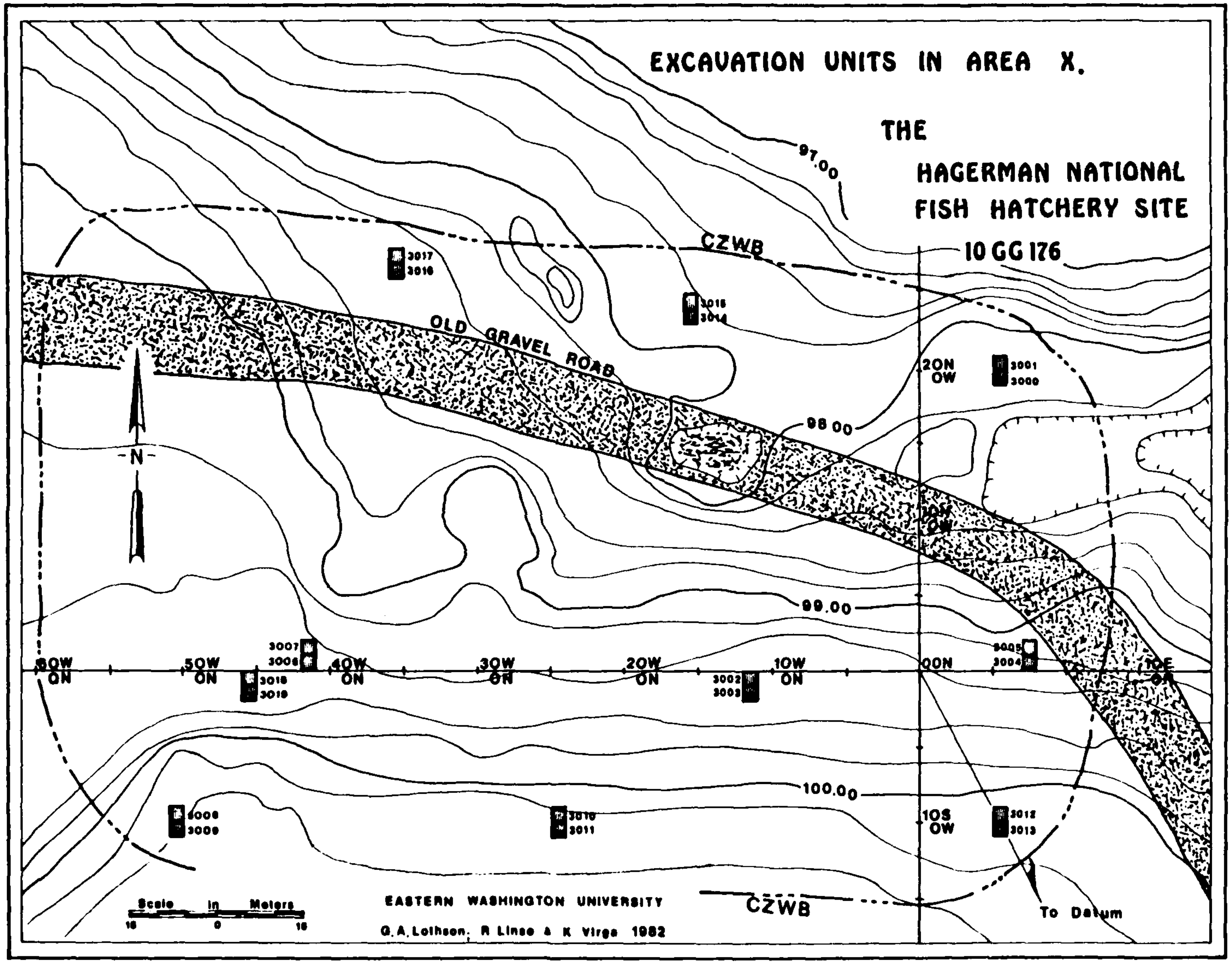


Figure 14. Excavation units and contour map of Area X.

Soil profiles were drawn for selected test units in each of the five tested areas. Representative profiles and descriptions for each area are presented in this report although the profile for excavation units X-1 and X-2 of Area VI derives from the second phase report (Lothson and Virga 1981: Figure 13). Munsell soil color charts (Soil Survey Staff 1975) were used to determine soil colors and the soil description format follows the Soil Survey Manual (Soil Survey Staff 1975). Soil and sediment samples were taken at 5 cm vertical intervals from test units in four of the tested areas (Areas V, VI, VIII, and IX), but from different test units than those whose profiles are presented here. Sediment sampling was not considered necessary for Area X due to the paucity of cultural material.

Matrix sampling for pollen/biosilicate and flotation analysis was not done due to the presumed poor preservation of organic material at the site. Charcoal was not found in sufficient quantity to warrant collecting samples for radiocarbon dating.

The baselines and horizontal grid system employed in the 1980 field season were used again and extended in 1981 to map test units and cultural material. Vertical control was established relative to a central datum that was given an arbitrary elevation of 100.00 m. This "control point" (see Lothson and Virga 1981:24, Figure 10) is at the corner of one of the raceway structures and is at a known elevation of 904.51 m (2967.54 ft) above sea level. Intermediate vertical control points were also used as needed. Both a transit and an alidade and plane table were used to produce maps with 10 cm and 20 cm contour intervals. Area X was so far away from other areas of the site that it was easier to employ a separate grid system for mapping than it was to expand the main grid system to its location.

Numerous photographs were taken of the site, excavated test units, and work in progress. Black-and-white print film was used almost exclusively, although some 35-mm color slides were also taken.

Analytic Methods

All of the cultural material recovered during excavation was taken to the AHS facilities in Cheney where it was cataloged and examined. Several categories, including historic debris, chipped stone debitage and tools, ground stone tools, ceramics, bone, and shell, were distinguished. Historic material was noted primarily to identify probable recent disturbance of prehistoric deposits. Chipped stone categories recognized by Lothson (in Lothson et al. 1982:51) were ". . . flake debitage, edge damaged [including utilized] flakes, retouched flakes, biface fragments, biface blanks, projectile points, scrapers, exhausted cores and chunks, flake cores, blades, blade cores (?), core tablets, and what appears to be a punch made from a flake." Lithic material types were identified by visual inspection and included obsidian, basalt, jasper, felsite, quartzite, opal, chalcedony, and cherts of various colors. Although much of the obsidian identified at 10GG176 may actually be vitrophyre, the material name of obsidian is maintained here in accord with the draft report (Lothson et al. 1982) for the sake of simplicity. Munsell color charts were used to standardize color identifications, and calipers were used for linear measurements. Debitage was size-graded and analysis was primarily descriptive as the scope of work did not call for a detailed analysis of technological attributes. Black-and-white photographs were taken of selected artifacts and on chipped stone items, a NH_4Cl coating was used.

Cultural material from test units in Areas VI and VIII excavated under the direction of Lothson in 1980 was included in the 1981 analysis. Some additional test units were placed (erroneously?) in other areas of the site; they are not considered here, although Lothson (in Lothson et al. 1982) did include a very few cultural items from these units in the draft of this report. Detailed analyses of bone and shell material did not prove to be feasible.

Soil profiles drawn in 1980 were used for comparative purposes in 1981, and some of the 1980 soil data is presented in the results described here. Soil data from sediment analysis of four areas of the site (Area X was excluded) were also compared. Analytic procedures in the sediment analysis included mechanical separation of the sand/gravel from the silt/clay fraction, and hydrometric analysis of the silt/clay fraction to determine grain size constituency. Grain sizes were expressed in phi (ϕ) units, and their distributional gradation from coarse to fine was plotted on log paper by percentile intercepts. Percentile intercepts were recorded for 1, 5, 16, 25, 50, 75, 84, and 95 phi sizes. These data were analyzed to determine mean class sizes, standard deviation (degree of sorting), skewness (gradation of size), and kurtosis (shape of the grain size curve). The formulas and statistical parameters for the sediment analysis of grain size were obtained from Folk and Ward (1957). The intent of the sediment analysis was to identify the depositional environment of the culture-bearing strata at 10GG176, identify evidence of prior disturbance, and to aid in distinguishing cultural components, if possible.

PART IV

RESULTS

Most test units were excavated to depths of no greater than 100 cm. Several units in Area V, however, were extended to 125-130 cm for the purposes of profiles and sediment sampling (e.g., X-1004, X-1031, and X-1032). No prehistoric cultural features, such as housepits, hearths, or storage pits were located in the test units excavated in 1980 and 1981. Of 163 test units considered here, 32 contained no cultural material. Five of these were in Area V, one was in Area VI, 12 were in Area VIII, three were in Area IX, and 11 were in Area X. Cultural material from the remaining 131 test units was distributed by area as shown in Table 2. More detailed inventories by test unit and level appear in Appendix A. Eleven pot sherds were also recovered from test units in Areas V, VIII, and IX. Extremely few (40) items of cultural material were found in Area X. Frequencies of cultural material recovered from the other areas range from 673 to 2422. Only presence/absence data was developed for the highly fragmented shell found at the site (Appendix A, Table 17). The individual descriptions of cultural material classes recovered from 10GG176 were taken directly from Lothson et al. (1982:Part VIII) and appear in Appendix B. Many of these classes have been combined in broader terms for discussion in the text which follows here. First, however, it is desirable to consider the depositional context of the recovered cultural material.

Table 2. Cultural Material Inventory Summary by Area.

Area	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Historic	Total
V	1531	66	24	729	72	2422
VI	597	42	26	110	106	881
VIII	380	26	18	49	200	673
IX	1093	49	3	163	67	1375
X	21	3	1	11	4	40
Total	3622	186	72	1062	449	5391

Comparative Stratigraphy and Historic Disturbance

Sediments bearing cultural material at 10GG176 are defined in three major depositional units: 1) undisturbed overbank sediments; 2) slightly disturbed overbank sediments; and 3) massively redeposited sediments. The major cause of the disturbances and redeposition apparently relate to the construction of the original fish hatchery complex. One aspect of the construction must have involved relatively extensive earth-moving, by which undulating areas of the site were leveled with fill derived from excavation of other areas for building foundations and for the raceways. The sediment analysis detailed in Appendix C and observations of the distribution of recent (post-A.D. 1900) historic debris (Table 3; Appendix A, Table 15) combine to identify the disturbed deposits of cultural material at the site. Sediment analysis did not reveal undisturbed strata that correlate with cultural material to help define any prehistoric cultural horizons. Photographs of the sediments in Areas VI, VIII, IX, and X are offered in Figures 15-18.

Area V contains undisturbed and slightly disturbed overbank sediments (Figure 19). The rapid decrease of gravel-sized particles at 30 cm depth in the deposits indicate a lower boundary for the disturbance in Area V. No historic debris was found below 40 cm depth (Table 3), and the only appearance of deeper disturbance is in the form of isolated posthole stains.

Area VI is characterized by sediments that have been greatly disturbed to a depth of 35 cm, which overlie only slightly disturbed overbank sediments that extend to 95 cm depth (Figure 20). The more deeply disturbed sediments in this area lie closest to the extant raceways. Historic debris

Table 3. Vertical Distribution of Historic Debris by Area.

Level	Area V	Area VI	Area VIII	Area IX	Area X	Total
1	25	27	3	8	4	67
2	36	42	93	10	0	181
3	8	21	55	12	0	96
4	3	14	18	8	0	43
5	0	2	2	5	0	9
6	0	0	2	7	0	9
7	0	0	1	12	0	13
8	0	0	0	5	0	5
9	0	0	5	0	0	5
10	0	0	21	0	0	0
Total	72	106	200	67	4	449

Figure 15. X-406 and X-420, Area VI, north wall.

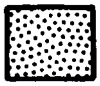
Figure 16. X-190 and X-191, Area VIII, east wall.

Figure 17. X-2010 and X-2011, Area IX, north wall.

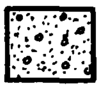
Figure 18. X-3002 and X-3003, Area X, east wall.

Surface; single-grained sandy loam; recent sod development; dark grayish-brown (10YR 4/2).

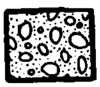
Single-grained; sandy; fill material and mixed subsoil overbank sediments, Ah horizon; irrigated; dark brown (10YR 4/3).



Fine- to coarse-grained sand, single-grained; no $CaCO_3$ cementation of the sand grains; cultural debris, flakes and other artifact frequencies high, particularly at the contact between the mixed disturbed soil above and this level; dark yellowish-brown (10YR 5/3).



Single-grained sandy soil, apparently water-deposited silt loam, a gradation from coarse (bottom) to fine (top) sand; some carbonate coating of sand grains but no cementation; no banded deposits; massive structure; some iron staining; yellowish brown (10YR 5/4 - wet).



Banded water-deposited sediments, possibly overbank sediments; sandy with some $CaCO_3$ cementation, indicating the perching of the water table above bedrock; some evidence of hardpan development; yellowish-brown (10YR 5/4).

Fine silt, water-deposited material; some cementation of grains; pocket deposits below hardpan; dark yellowish-brown (10YR 5/3).

Basalt bedrock, vesicular to fine-grained; depth varies from near the surface to several meters below surface.

Figure 19. Selected stratigraphic profile and description, Area V.

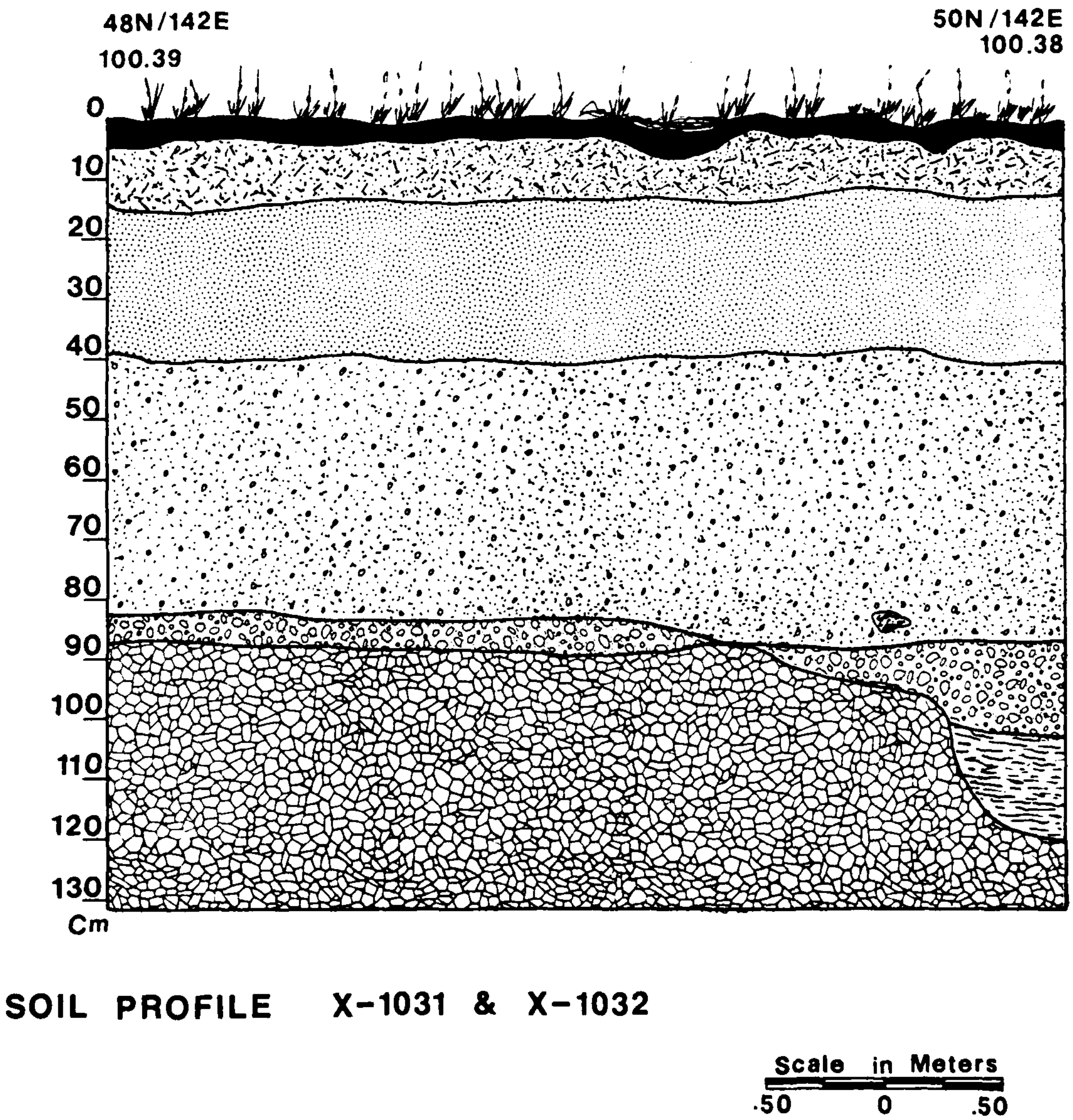
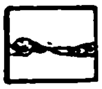


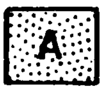
Figure 19. Selected stratigraphic profile and description, Area V.


Surface; single-grained sandy loam; recent sod development; dark grayish-brown (10YR 4/2).

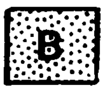

Single-grained sandy soil; mixed, disturbed fill material; Ah horizon; irrigated; dark brown (10YR 4/3).


Old buried sod layer, not yet decomposed; dark grayish-brown (10YR 4/2).


Eroded soil, possible aboriginal surface; fine sand, laminated in places; dark brown (10YR 4/3).



Fine- to coarse-grained sand, single-grained; no $CaCO_3$ cementation of the sand grains; cultural debris (flakes, charcoal) present, but not concentrated; rock present; moisture change at boundary; dark brown (10YR 5/3).



Single-grained silt loam with some coarse sand present; non-sticky and non-plastic; no ped development; massive structure; dark yellowish-brown (10YR 5/3).


Water-deposited silt loam; single-grained sandy soil which grades from fine (top) to coarse (bottom); some carbonate coating of sand grains, but no cementation; small gravel fragments; no banded segments; some iron staining in the lowest level; yellowish-brown (10YR 5/4 -wet).


Unexcavated subsoil.


Large rock fragments (erosional surface).

Figure 20. Selected stratigraphic profile and description, Area VI.

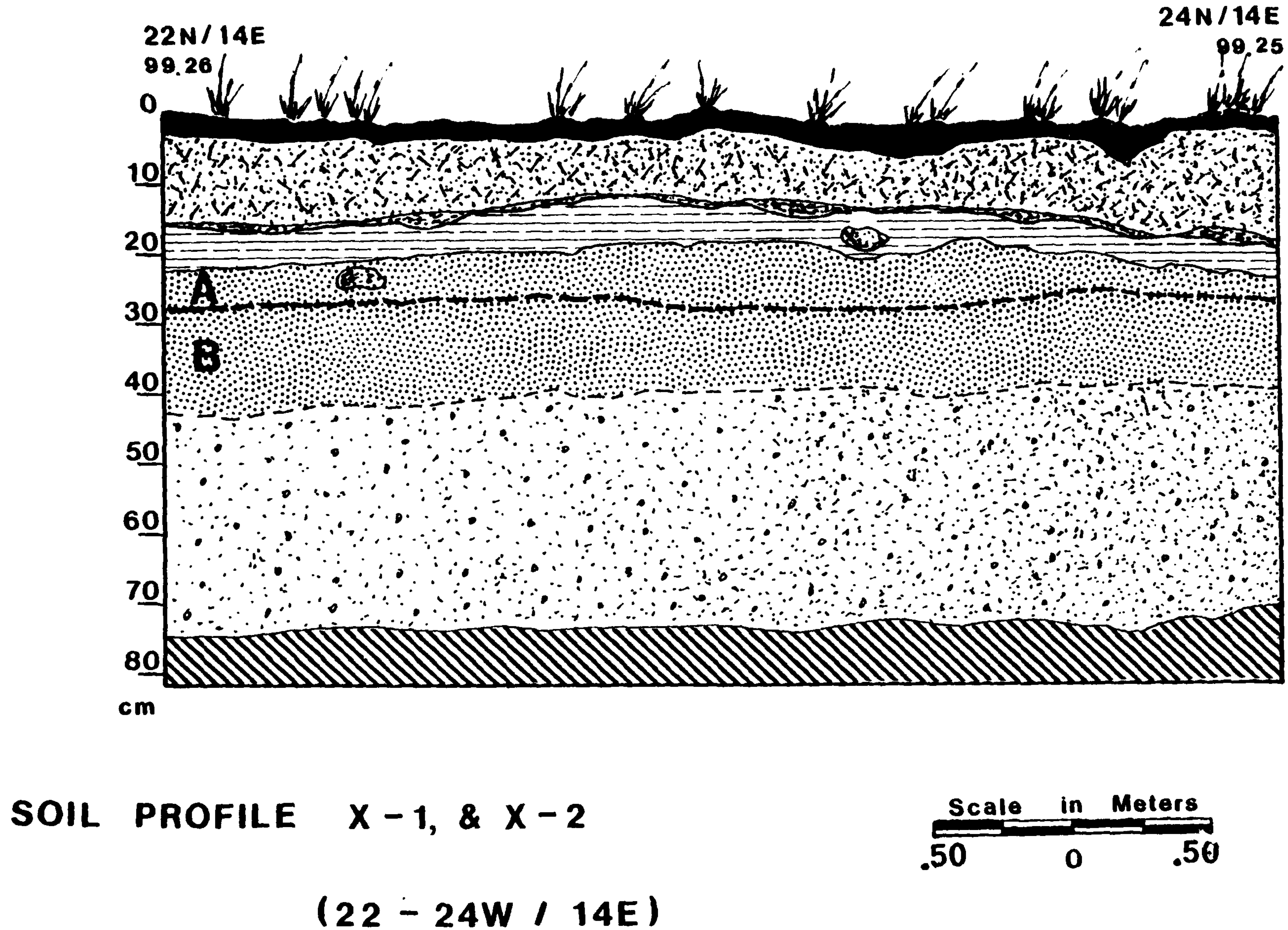


Figure 20. Selected stratigraphic profile and description, Area VI.

was found no deeper than 50 cm and most of it above 40 cm (Table 3). Lothson et al. (1982:38) suggests that this location was leveled for a parking area by filling in depressions in gently undulating topography.

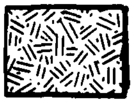
Nearly all of the sediments exposed in Area VIII appear to be badly disturbed (Figure 21), and most of them probably are redeposited from the original hatchery construction. Sediment particles are unsorted and historic debris was collected from depths to 100 cm. In addition, excavators found a large modern tree trunk, large pipes, and a cesspool cover at 100 cm and greater depths (Rice 1982:personal communication). Only a few test units exposed undisturbed deposits near their bottoms in the form of thin, primary water-deposited sediments lying over basalt bedrock (Appendix C). No prehistoric cultural material was recovered from below 90 cm in Area VIII (Appendix A). Thus, this entire area must be considered to contain prehistoric cultural material only in a severely disturbed context.

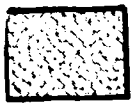
Area IX contains only mixed and redeposited sediments (Figure 22). The sediments contain fragments of rusty iron, concrete, glass, wire, nails, basalt, gravel, sand, and silt. Although historic debris is not particularly numerous, it was recovered to a depth of 80 cm (Table 3), the same level below which no prehistoric cultural material was found either (Appendix A). Although the sediments contain considerable quantities of prehistoric cultural material, it all appears to have been redeposited. It may well have come from the area under the extant raceways, if sediments excavated in the construction of those raceways were dumped and leveled in Area IX (also noted by Lothson et al. 1982:45). Pavesic and Meatte (1980:79) suggest that ". . . the main hatchery complex was built on the major portion of the original site." If so, earth removed in the construction of the raceways probably would have contained much cultural material.

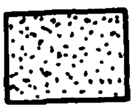

Surface; single-grained very fine sand and silt having a high ogranic content; roots and rootlets; dark grayish-brown (10YR 4/2).

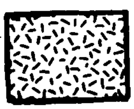

Recently formed soil containing very fine sandy silt, few roots, and slightly compacted fill material. Some mixing due to animal activity; brown (10YR 5/3).

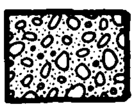

Very fine to fine sand mixed with silt, some coarse sand and gravel mixed. Slightly more compacted and appears to represent fill debris; brown (10YR 5/3).


Very fine sand and silt, some lenses of coarse sand and pebble-sized gravel; slightly compacted; some banding present; brown (10YR 5/3).


Fine to very fine mixed silt and sand; some coarse sands and gravels present; variable color, brown (10YR 5/3) to dark brown (10YR 3/3).


Fine to very fine mixed sand, silt, and gravel; a few fine gravel lenses and pea-sized gravel particles; variable color, brown (10YR 5/3) to dark brown (10YR 3/3).


Fine to very fine sand and silt, some coarse sand and pea-sized gravel; slightly compacted, appears to be fill; brown (10YR 5/3) to dark brown (10YR 4/3).


Fine to very fine sand, coarse sand mixed with a few gravel lenses; some cross-bedding present, represent slow deposition of redeposited material; some laminations; dark brown (10YR 3.3).


Fine sand and silt mixed with small angular fragments of gravel; compacted; some laminations; brown (10YR 5/3) to dark brown (10YR 3/3).


Large rock fragments.

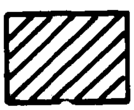

Unexcavated subsoil.

Figure 21. Selected stratigraphic profile and description, Area VIII.

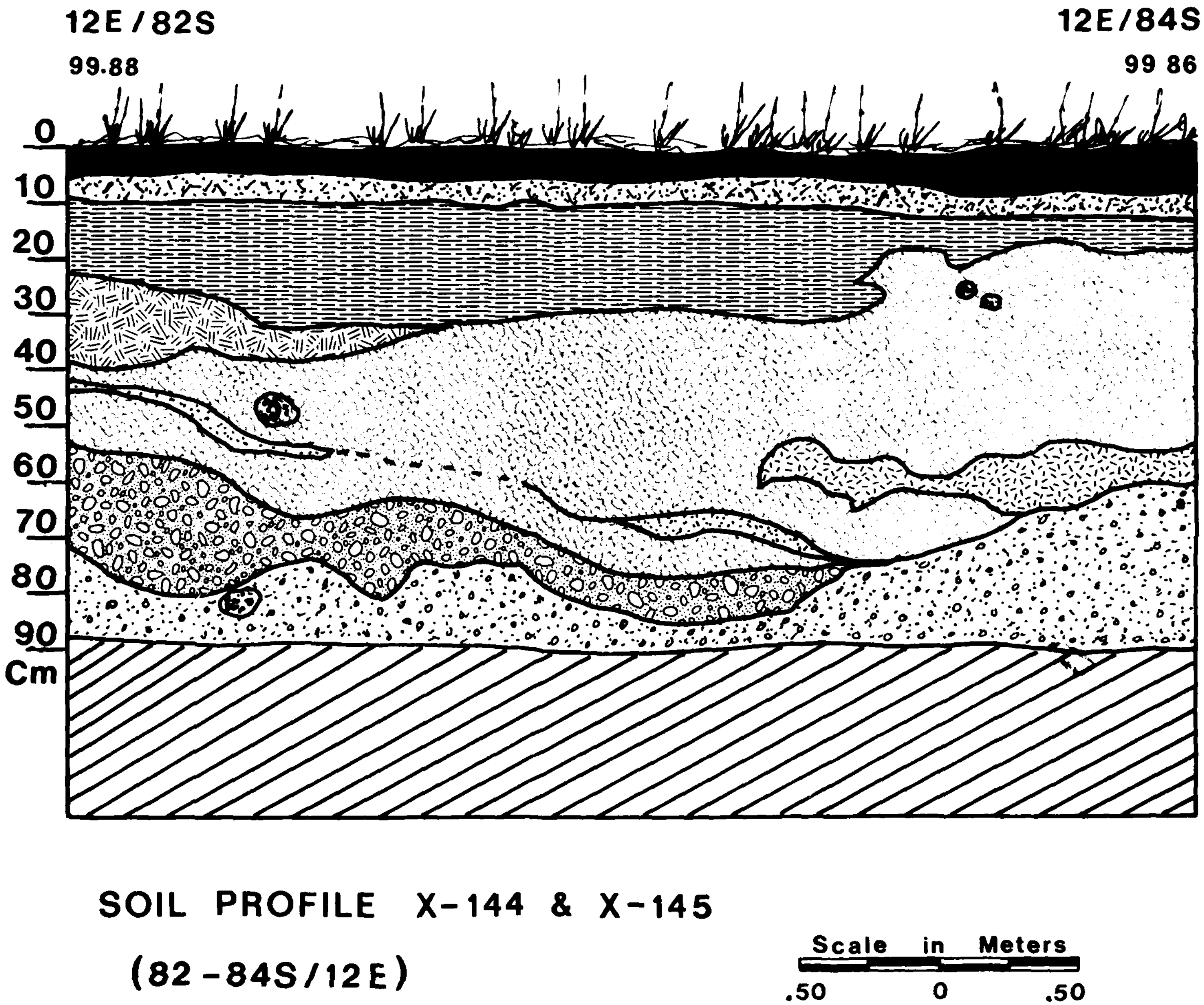
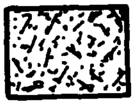
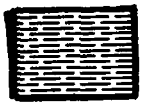


Figure 21. Selected stratigraphic profile and description, Area VIII.

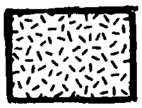
Surface; loose, single-grained sandy silt; some small roots and rootlets growing beneath recently planted grasses; dark grayish-brown (10YR 4/2).



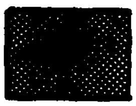
Sandy silt mixed with angular fragments of basalt; asphalt and other historic debris mixed with prehistoric artifacts, indicating that this is recent fill; variable color, brown (10YR 5/3) to dark brown (10YR 3/3).



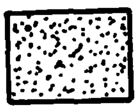
Very fine sand and silt mixed with historic debris; some gravel and asphalt fragments; appears to be a lens of fill redeposited during construction of the hatchery; very dark brown (10YR 2/2).



Very fine to fine sand and silt mixed with historic debris; lens of gravel interbedded with matrix; some concrete fragments and angular fragments of basalt; large lenses (yellowish-brown, 10YR 5/4) are distinctive and easily separated; dark brown (10YR 4/3).

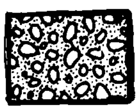


Discontinuous area of very dark organic material (rodent burrow); some fragments of gravel mixed with coarse to fine sand; very dark brown (10YR 2/2).

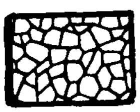


Fine sand and silt; light-colored lenses; some gravel mixed throughout the deposit; angular fragments of basalt on the contact surfaces with adjacent units; brown (10YR 5/3) to light yellowish-brown (10YR 6/4).

Fine sand and silt mixed with historic and prehistoric debris; gravel, asphalt, concrete, and angular basalt fragments present; laminations of deposit having large fragments of gravel lined up with bedding planes; dark brown (10YR 5/3) to very dark brown (10YR 2/2).



Fine sand, silt, and pea-sized gravel; deposit appears to be naturally deposited; no historic debris, and limited prehistoric material; variable color, brown (10YR 5/3) to dark brown (10YR 4/3).



Basalt bedrock, vesicular to fine-grained.

Large basalt rock fragments.

Figure 22. Selected stratigraphic profile and description. Area IX.

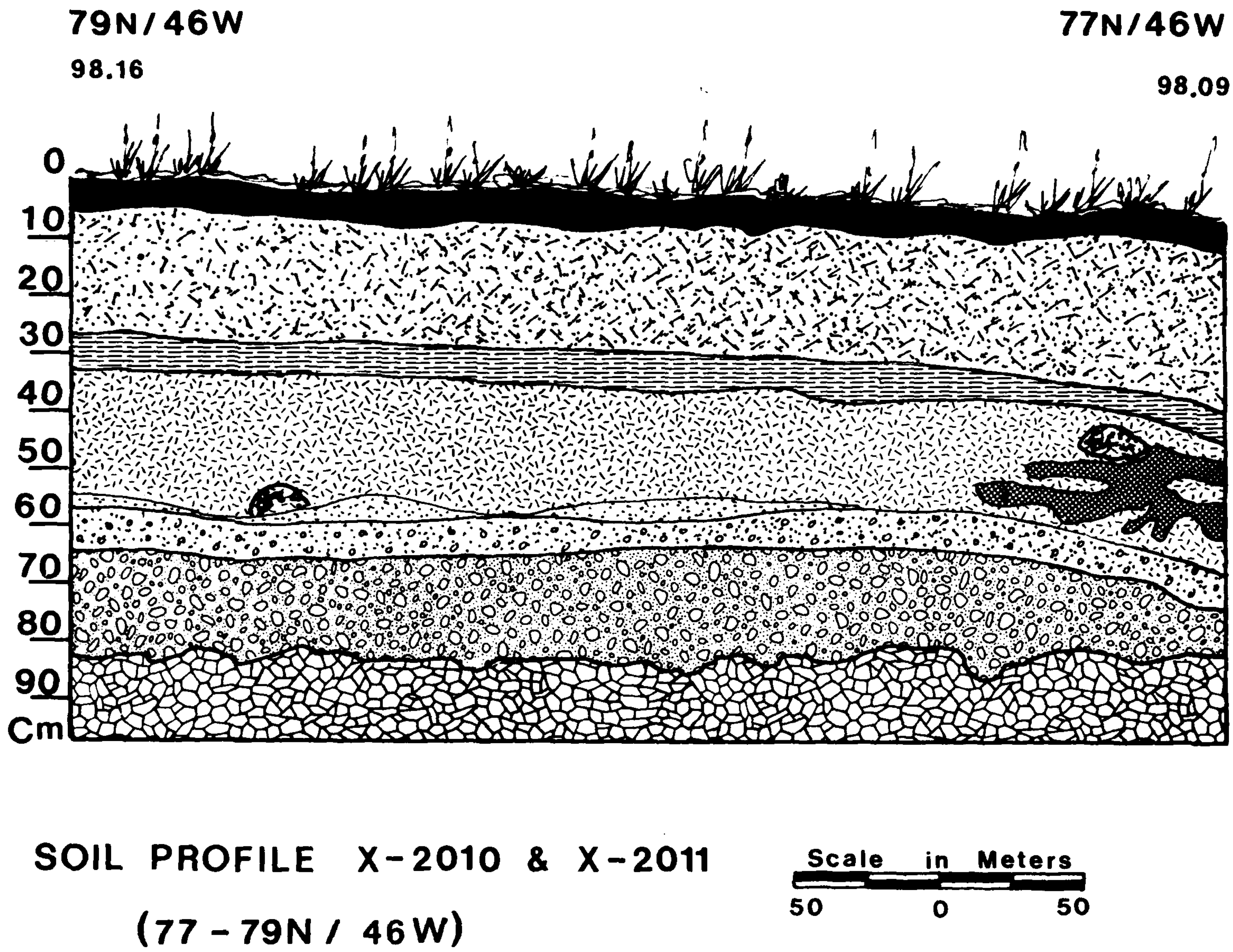


Figure 22. Selected stratigraphic profile and description, Area IX.

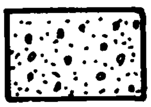
Area X is removed somewhat from the other projected impact areas tested. It also appears to be only peripheral to the prehistoric site. Evidence of recent disturbance is minimal there, but so is any evidence of prehistoric cultural activity. Consequently, no sediment samples were taken from Area X, which is on a rise and appears to have aeolian deposits immediately above more overbank sediments (Figure 23).

Bone and Shell

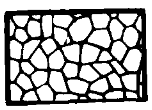
A total of 1062 bones and bone fragments were recovered from subsurface testing in the five areas (Table 4; Appendix A, Table 16). Over 75% of these are from Areas V and VI with distinct concentrations in Level 4 in both areas. These remains are concentrated in the northwest portion of Area V and the western edge of Area VI (Figures 10 and 11; Appendix A, Table 16). This concentration in such quantity is expectable in Area V as this is the portion of Area V closest to the housepit features found by Pavesic and Meatte (1980). Area VI also may be near or in a locus of relatively intense prehistoric cultural activity, but to a much lesser degree than Area V, judging by the relative numbers of material.

Unfortunately, examination of the faunal remains has not provided much additional information beyond what Pavesic and Meatte observed (1980:72-74). Their investigations identified jackrabbit (cf. *Lepus*), coyote (*Canis*), badger (cf. *Taxidea*), antelope (cf. *Antilocapra*), bobcat (*Lynx* cf. *rufus*), and possibly bison (*Bovid*). Their only data for minimum numbers of individual animals represented were for three rabbits and one badger, primarily due to the fragmentary condition of the specimens. Although the three rabbits could represent a single kill (Pavesic and Meatte 1980:74), no major

Surface; single-grained sandy loam; very fine dry sand, wind-blown and reworked; occasional fragments of pea-sized angular basalt; no distinct boundary with the underlying deposits; dark grayish-brown (10YR 5/3) to light brownish-gray (2.5YR 6/2).



Fine to very fine sand; loosely compacted and appear to be wind-reworked overbank sediments originally deposited by the creek; moderate compaction at the bottom of the unit at the contact with the underlying basalt; some iron staining; presence of $CaCO_3$; silt concentrated at 10 cm above bedrock; light brownish-gray (2.5Y 6/2).



Basalt bedrock.

Isolated rocks.

Figure 23. Selected stratigraphic profile and description, Area X.

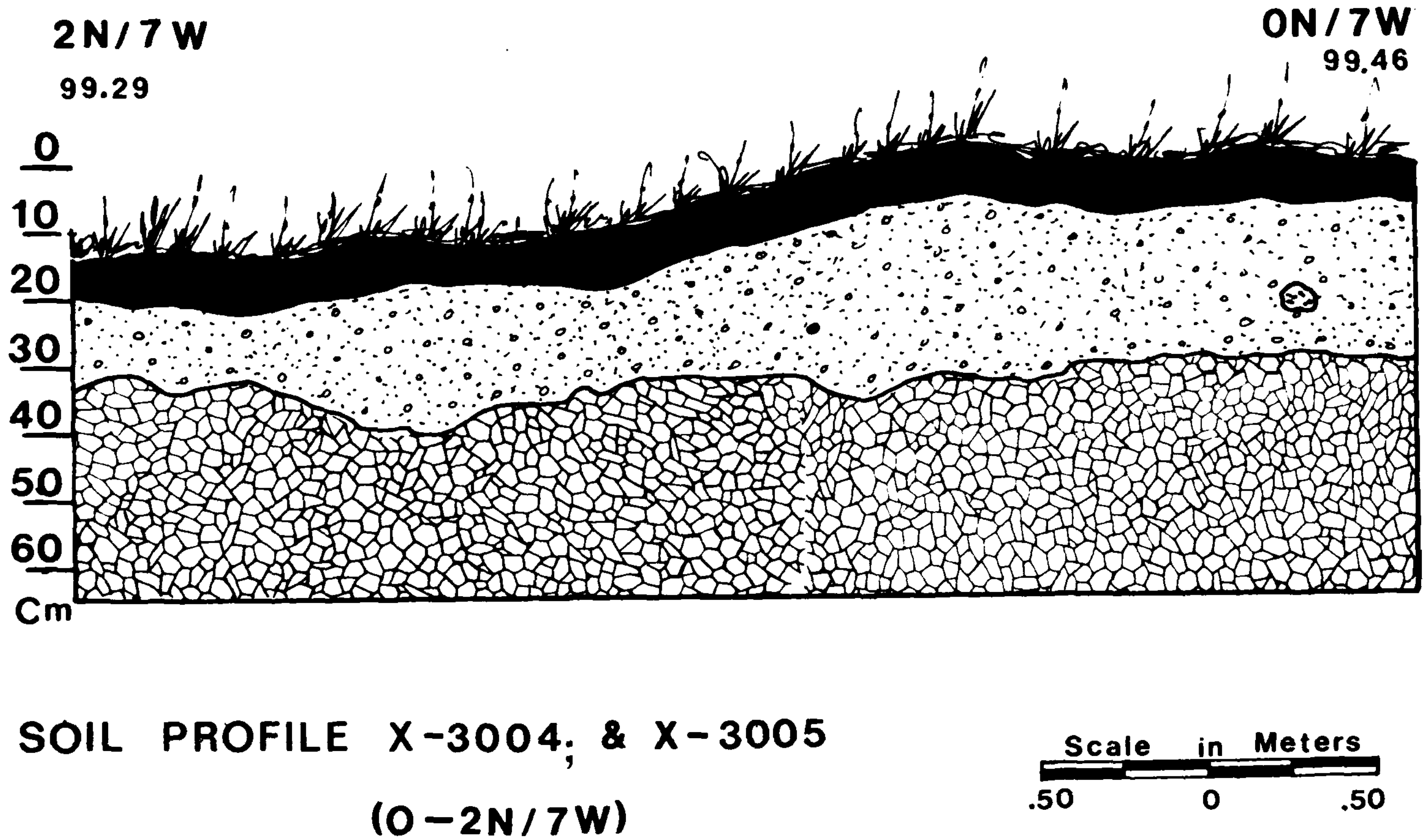


Figure 23. Selected stratigraphic profile and description, Area X.

Table 4. Vertical Distribution of Bone and Shell by Area.*

Level	Area V		Area VI		Area VIII		Area IX		Area X		Total	
	Bone	Shell	Bone	Shell	Bone	Shell	Bone	Shell	Bone	Shell	Bone	Shell
1	13	+	2	+	1	0	1	0	1	+	18	+
2	117	+	21	+	4	0	4	+	2	0	148	+
3	116	+	27	+	1	0	19	+	1	+	64	+
4	326	+	55	+	11	0	43	+	7	0	442	+
5	71	+	3	+	19	0	43	+	0	0	136	+
6	60	+	1	0	4	0	41	+	0	0	106	+
7	0	+	1	0	4	0	10	+	0	0	15	+
8	0	0	0	0	2	0	2	+	0	0	4	+
9	19	0	0	0	3	+	0	0	0	0	22	+
10	7	0	0	0	0	0	0	0	0	0	7	0
Total	729	---	110	---	49	---	163	---	11	---	1062	---

*Presence (+)/absence (0) only for shell.

butchering area for large mammals was identifiable. Nor could there be any estimation of the season of site occupation from the faunal remains. Phase II and III investigations provided more burned and highly fragmented bone with many fragments no larger than 2 cm in maximum dimension. Only 14 of the 1062 specimens were identifiable. Lothson himself examined the material and identified the following (Lothson et al. 1982:92):

> . . . jackrabbit (cf. _Lepus_), bison (_Bison bison_), antelope (_Antilocapra americana_), deer (cf. _Odocoileus_), coyote (_Canis latrans_), gopher (_Thomousys townsendii_ [sic]), badger (cf. _Taxidia_ [sic]), and one vertebra of fish probably salmon (_Oneorhynchus_ [sic]).

It is assumed here that the gopher is northern pocket gopher whose taxonomic name should be _Thomomys talpoides_.

It appears from the condition of the bones at 10GG176 that most of them were broken and split for their marrow and perhaps for grease extraction (Leechman 1951; Bonnichsen 1973; Cleveland 1978; Binford 1981). A method for this is suggested by Cleveland (1978:47-48):

> The most efficient way to remove the red marrow contained in the epiphyses is to reduce the bone to cancellous fragments (Wimberly and Eidenbach 1973), immerse these in a container such as a wooden bowl or a watertight basket, add water and heated stones, and bring to a boil. This treatment extracts the red marrow into the water, forming a bone grease (Leechman 1951) and/or a bone soup.

Bone splinters, with tapering breaks could suggest such activity at 10GG176. But subsequent discard behavior or use of bone for fuel, in which bones or bone splinters are thrown into a fire, would cause further fragmentation (with right-angle breaks) and may obscure the splinter-effect evidence of marrow extraction. Burned, blocky fragments of mammal bone are the most common at the site. More detailed work than was called for in the scope of work would be required to sort out this variation.

The mollusk shell fragments found at 10GG176 are too fragmented to identify accurately. Only their presence/absence has been noted by level (Table 4; Appendix A, Table 17). Shell was noted in most test units in the northwest portion of Area V, but otherwise appear to have been distributed randomly at the site both horizontally and vertically. Of the two major genera of mollusk known to be found on the Snake River, viz., Margaritifera and Gonoidea, Lyman (1980:121-136) notes that prehistorically the latter were more frequent in the lower Snake River region.

Chipped Stone Tools

Table 5 denotes 186 chipped stone tools that were recovered from the five areas tested at 10GG176. Some additional tools were considered by Lothson (1982 and Appendix B of this report), but they are not precisely from the test areas and are not considered here. The vertical distribution of these tools reflects the disturbance in Areas VIII and IX noted above. The discussion here centers on the tools recovered from Areas V and VI.

Most of the tools from Area V were found in test units excavated nearest where Pavesic and Meatte (1980) discovered housepits and other features. As with the bone and shell remains, these tools were found concentrated in the northwest portion of Area V. Sixty-six tools are considered here, including seven cores, eight scrapers, 11 bifaces and biface fragments, 35 projectile points and projectile point fragments, and five modified (retouched or utilized) flakes (Table 6). In both areas, most of the chipped stone tools, indeed most all of the cultural material, was recovered from Levels 2-5. There is no firm evidence in the cultural material collection nor in the stratigraphy (Appendix C) to distinguish any cultural horizons in the areas tested.

Table 5. Vertical Distribution of Chipped Stone Tools by Area.

Level	Area V	Area VI	Area VIII	Area IX	Area X	Total
1	3	3	2	1	2	11
2	17	13	1	4	1	36
3	10	12	2	5	0	29
4	18	9	6	13	0	46
5	14	5	3	13	0	35
6	3	0	2	5	0	10
7	1	0	3	6	0	10
8	0	0	2	2	0	4
9	0	0	4	0	0	4
10	0	0	1	0	0	1
Total	66	42	26	49	3	186

Table 6. Vertical Distribution of Chipped Stone Tool Classes in Areas V and VI.*

Level	Area V						Area VI					
	C	S	B	P	M	Total	C	S	B	P	M	Total
1	0	1	0	2	0	3	2	0	1	0	0	3
2	2	2	3	9	1	17	3	0	5	3	2	13
3	1	0	3	6	0	10	3	0	3	4	2	12
4	2	3	3	8	2	18	2	1	3	0	3	9
5	2	1	1	8	2	14	1	1	0	2	1	5
6	0	0	1	2	0	3	0	0	0	0	0	0
7	0	1	0	0	0	1	0	0	0	0	0	0
8-10	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	8	11	35	5	66	11	2	12	9	8	42

*C = core; S = scraper; B = biface or biface fragment; P = projectile point or projectile point fragment; M = modified (retouched or utilized) flake.

Functionally, the chipped stone tools from Area V (Table 6) are evidence of an eclectic set of activities. Primary lithic core reduction appears to have been a common activity, although there appears to be an anomaly with the material types used (see below). Scraping and cutting activities, as evidenced by the number of scrapers and bifaces, were emphasized equally. The modified flakes may be indicative of an opportunistic behavior often associated with lithic reduction; it simply may have involved finding suitable item(s) of debitage for use as cutting and scraping implements for a task at hand. However, the production of flakes suitable for specific tasks also could have been more deliberate. Such items may have been used with little or no deliberate modification (retouch). An emphasis on hunting activities is suggested by the 35 projectile points and fragments from Area V. The cutting and scraping tools may well have been used in butchering activities (cf. the number of bone fragments from Area V), although their use in processing plant materials cannot be precluded. There are no obvious indications of variation in the function of this tool assemblage in the vertical distribution of these tools (i.e., through time).

Chipped stone tools in Area VI (Table 6) reflect the same types of activities as do those from Area V. However, the density of cultural material is much less in Area VI, which is farther away from the known housepits. Fewer and possibly more specialized activity areas are expected to be located in areas progressively farther away from the densest locale of site occupation. Area VI appears to exhibit a greater relative emphasis on lithic reduction and biface manufacture or use, and a reduced emphasis on hunting and scraping activities. Opportunism involved in the "production" or use of modified flakes may have been more intense here. Relative

concentration of artifacts in the western portion of Area VI (Appendix A, Table 18) may be the result of a more or less discrete activity area there (cf. Lothson et al. 1982:97-98).

Similar general observations may be made on the total assemblages from Areas VIII, IX, and X (Table 7). Deposits in Area VIII are badly disturbed and are well away from the central area of the site. Overall the chipped stone tools from Area VIII exhibit equal emphases on scraping and cutting activities with the greatest emphasis on core reduction and flake tools. The relative level of apparent hunting-related activities is similar to Area VI. Area IX exhibits a low emphasis on core reduction, scraping, and hunting-related activities, with the most emphasis on biface production or use and on flake tool use. In addition, the only drill/perforator found in the Phase II and III investigations was from Area IX. Unfortunately, the Area IX assemblage derives from completely redeposited sediments. Functionally, it is very similar to area VI. One biface and two projectile points are the only chipped stone tools found in Area X, which is the area farthest away from the known housepits.

Lithic raw material variability at 10GG176 shows an overall predominance of obsidian/vitrophyre in the chipped stone tools. this is especially true of the projectile points and bifaces (including fragments), nearly 80% of which are made of obsidian/vitrophyre. However, most scrapers (13 of 18) were made of chert, a tougher and less brittle material than obsidian/vitrophyre, and two were made of basalt. Of the 28 cores considered here for the site, only six were identified as obsidian/vitrophyre, nine were of chert, seven were of jasper, three were of opal, and two were of basalt. Obsidian/vitrophyre is the most common material for flake tools (i.e., modified

Table 7. Chipped Stone Tools from Areas VIII, IX, and X.*

Area	C	S	B	P	D	M	Total
VIII	6	3	2	5	0	10	26
IX	4	5	15	10	1	14	49
X	0	0	1	2	0	0	3
Total	10	8	18	17	1	24	78

*C = core; S = scraper; B = biface or biface fragment; P = projectile point or projectile point fragment; D = drill/perforator; M = modified (retouched or utilized) flake.

flakes) accounting for 20 of 37 items (54%), but chert (11), basalt (5), and jasper (1) also were identified. The one drill/perforator from Area IX was made of obsidian/vitrophyre. There does not seem to be any strongly patterned variation in tool stone selection from area to area or from level to level. It simply appears that the obsidian/vitrophyre was selected primarily for the cutting and piercing qualities of the edges it yields, while the cherts are somewhat tougher and make better scraping implements. The relatively low number of obsidian/vitrophyre cores suggests that few such cores were reduced at the site. Perhaps this material was brought onto the site in already partially reduced form. However, Sappington (1982:personal communication) suggests that secondary deposits of Brown's Bench vitrophyre are available locally, and long-distance transport of the material may not have been necessary.

In the absence of chronometric dates from the site, the projectile point data takes on additional importance in providing an estimation of the site's time of occupation. Of 61 points and point fragments, 41 were typable. This was done by Lothson et al. (1982 and Appendix B of this report) by comparing specimens to previous finds from 10GG176 and from other sites. Lothson et al. (1982:60) note some uncertainty in the identifications of Wallula rectangular-stemmed, "Bliss type, Cottonwood," Elko, Bitterroot, and Blue Dome side-notched points. The reworking of points broken in manufacture or use (Flenniken 1977:87) also may have contributed to the difficulties involved in this morphological classification (Lothson et al. 1982:59).

Desert side-notched (n = 7) and Rose Springs corner-notched (n = 13) points are the predominant forms in the least disturbed areas of the site from Level 5 and above (Table 8). These points constitute widespread

Table 8. Projectile Points from 10GG176.*

Type	Levels in Areas V, VI, X									Levels in Areas VIII, IX									TOTAL
	1	2	3	4	5	6	7	8	Total	1	2	3	4	5	6	7	8	Total	
Desert side-notched	1	4	0	1	1	0	0	0	7	0	2	0	1	0	0	0	1	4	11
Rose Springs corner-notched	0	5	3	2	3	0	0	0	13	0	1	0	1	0	0	0	0	2	15
Elko corner-notched	0	1	3	1	0	0	0	0	5	0	0	0	0	0	0	0	0	0	5
Elko side-notched	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Elko eared	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Bliss	0	1	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Wallula rectangular-stemmed	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	2
Cottonwood	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Bitterroot side-notched	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Blue Dome side-notched	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Stemmed, indented-base	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	1	12	6	4	7	1	0	0	31	0	3	1	2	2	0	1	1	10	41

*From Lothson (1982:Table 17).

cultural manifestations that most likely do not predate 1450 B.P. (A.D. 500) (cf. Butler 1980:7) and probably are no earlier than 850-750 B.P. (A.D. 1100-1200 (cf. Butler 1978;71; Heizer and Hester 1978; Holley 1977; Baxter 1981). The most intensive occupation of the site could date to much later times, perhaps even just prior to Euroamerican contact. Some of the point forms also could date to much earlier times. For instance, the stemmed, indented-base, Bitterroot side-notched, and Elko series points have been identified at other sites from strata dating as early as 8000-7200 B.P. (6050-5250 B.C.) (Butler 1978:69). However, the possibly earlier points are very infrequent, and most of them derive from disturbed stratigraphy. Presuming that prehistoric peoples would have used this location several times over many years, and that later peoples may have picked up earlier points, the presence of a few anomalous early points is not particularly surprising. Most of the points from 10GG176 are very similar in size, shape, and style to those recovered from the Birch Creek area's Bison and Veratic rockshelters (Swanson 1972). At these rockshelters, Swanson (1972:200) had 87% Desert side-notched points in the Lemhi phase assemblages and 60% corner-notched specimens in the earlier Blue Dome phase. Swanson (1972:200) dates the Lemhi phase to A.D. 1250-1850 and the Blue Dome phase to 950 B.C.-A.D. 1250; Butler (1981:15) estimates the Lemhi phase to begin around A.D. 1800 and A.D. 500 to A.D. 1600-1700 for the Blue Dome phase. The points from 10GG176, from all of the investigations there to date, suggest a relatively late (post-A.D. 1100?) time period for its most intensive occupation. This is based on the co-occurrence and general predominance of Desert side-notched and a variety of corner-notched points at the site.

The projectile point data does not offer any definitive evidence for the cultural affiliation(s) of the occupation(s) at 10GG176. Although Butler (1980:7) suggests that the Rose Springs corner-notched points are part of the Great Salt Lake Fremont cultural assemblage in the eastern Great Basin, he also notes (1980:9) that these and other projectile points identified by Pavesic and Meatte (1980) have been found in association with Shoshonean sites (cf. Aikens 1970:Figure 24; Dalley 1976:Figure 15). The projectile points identified by Lothson et al. (1982) are much the same as those found by Pavesic and Meatte (1980). Butler (1980:9) concludes that it is impossible to definitely identify a Fremont as opposed to a Shoshonean occupation at 10GG176 on the basis of projectile point data alone. This still appears to be very true.

Debitage

A total of 3622 items of debitage were collected from the five areas tested (Table 9). These primarily consist of waste flakes as by-products of the lithic reduction that occurred at 10GG176. Items of blocky, "nondiagnostic shatter" (Bucy 1974:18; Crabtree 1972:90) also constitute a small portion of the debitage from the site and are included in the data presented here. The debitage was size-graded and sorted by raw material type, but the relative amounts of cortex left on the dorsal surfaces of these items was not examined by Lothson et al. (1982). Therefore, it is not possible to determine whether or not there are relatively few primary flakes of obsidian/vitrophyre to compare with the paucity of cores of this material type. This is one question that should be addressed in any further investigations of the site.

Table 9. Vertical Distribution of Chipped Stone Debitage by Area

Level	Area V	Area VI	Area VIII	Area IX	Area X	Total
1	113	41	8	5	6	173
2	369	119	11	57	5	561
3	364	209	23	211	6	813
4	321	147	69	287	2	826
5	204	48	74	244	1	571
6	120	21	67	133	1	342
7	22	6	48	126	0	202
8	9	2	54	30	0	95
9	9	4	26	0	0	39
10	0	0	0	0	0	0
Total	1531	597	380	1093	21	3622

Lothson et al. (1982:52) suggest that the flakes collected from 10GG176 principally represent bifacial thinning and core reduction flakes, with very little representation of fine percussion or pressure flakes. Lothson et al. (1982:52) would assign this debitage to "Stage Two and Stage Three of Flenniken's Stone Tool Production Sequence" (Flenniken 1978:69-101). They also note that the screen size (6 mm or 0.25 in) probably would allow small flakes to pass through uncollected. Nearly 88% of all the flakes are of the 20 mm size or smaller and probably do represent mid-to-final stages of tool production (Table 10). The relatively low number of larger flakes suggest that, if primary flakes are generally large here, then very little primary reduction occurred at the site. Of course, primary flakes are generally larger and fewer in number, so this estimation may be erroneous. The paucity of cores, particularly obsidian/vitrophyre cores, however, also suggests limited primary reduction at the site. Lothson et al. (1982:81; Appendix B of this report) identified eight blades of chert (n = 5), obsidian (n = 2), and basalt (n = 1). This low frequency of blades is no more than may be expected from any lithic reduction system, and a specific blade technology can only be suggested as a slight possibility. These eight items are not included in the debitage data presented here, but they appear in Lothson's cultural material descriptions (Appendix B). Area V shows some 13% more 10 mm and 5 mm size flakes than Area VI (Table 10) suggesting that relatively more final (or near-final) stage tool manufacture occurred closer to the known housepits. There does not appear to be any other possibly significant variations in the debitage data from area to area at the site.

The lithic raw materials represented in the debitage collection are presented in Table 11 and in more detail in Appendix A (Table 21). Overall

Table 10. Debitage Size Grades and Relative Frequencies by Area.

Flake Size (mm)	Area V		Area VI		Area VIII		Area IX		Area X		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
5	47	3.1	14	2.3	20	5.3	7	0.6	0	0.0	88	2.4
10	612	40.0	163	27.3	134	35.3	425	38.9	6	28.5	1340	37.0
15	508	33.2	220	36.9	140	36.8	298	27.3	7	33.3	1173	32.4
20	225	14.7	107	17.9	56	14.7	184	16.8	2	9.5	574	15.8
25	87	5.7	51	8.5	18	4.7	95	8.7	2	9.5	253	7.0
30	31	2.0	23	3.9	6	1.6	50	4.6	1	4.8	111	3.1
35	12	0.8	15	2.5	5	1.3	16	1.5	0	0.0	48	1.3
40	6	0.4	2	0.3	0	0.0	5	0.5	1	4.8	14	0.4
45	2	0.1	0	0.0	1	0.3	9	0.8	1	4.8	13	0.4
50+	1	<0.1	2	0.3	0	0.0	4	0.3	1	4.8	8	0.2
Total	1531	100.0	597	99.9	380	100.0	1093	100.0	21	100.0	3622	100.0

Table 11. Lithic Raw Material Relative Frequencies in Debitage by Area.*

Material Type	Area V		Area VI		Area VIII		Area IX		Area X		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Obsidian	806	52.6	374	62.7	147	38.7	846	77.4	10	47.6	2183	60.3
White Chert	130	8.5	26	4.4	11	2.9	53	4.9	1	4.8	221	6.1
Buff Chert	28	1.8	4	0.7	3	0.8	13	1.2	1	4.8	49	1.4
Pink Chert	20	1.3	8	1.3	8	2.1	5	0.5	0	0.0	41	1.1
Brown Chert	86	5.6	11	1.8	14	3.7	21	1.9	2	9.4	134	3.7
Grey Chert	107	7.0	58	9.7	28	7.4	30	2.7	1	4.8	224	6.2
Green Chert	12	0.8	2	0.3	1	0.2	7	0.6	0	0.0	22	0.6
Red Chert	70	4.6	21	3.5	41	10.8	17	1.5	3	14.2	152	4.2
Jasper	119	7.8	17	2.8	18	4.8	22	2.0	1	4.8	177	4.9
Opal	7	0.5	1	0.2	1	0.2	1	0.1	0	0.0	10	0.3
Chalcedony	28	1.8	5	0.9	1	0.2	2	0.2	1	4.8	37	1.0
Basalt	118	7.7	70	11.7	107	28.2	75	6.9	1	4.8	371	10.2
Quartzite	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	1	0.1
Total	1531	100.0	597	100.0	380	100.0	1093	100.0	21	100.0	3622	100.0
All Cherts	453	29.6	130	21.8	106	27.9	146	13.4	8	38.1	843	23.3

*Adapted from Lothson (1982:Table 16).

on the site, obsidian/vitrophyre is the material type most heavily represented by the debitage. Slightly over 60% of both chipped stone tools and debitage are from obsidian/vitrophyre. This probably is a result of the material's relatively local availability. It appears that slightly more of it was used in Area VI than in Area V, and that more chert was used in Area V. Basalt constitutes some 10% of the debitage collection, which is slightly more frequent than basalt chipped stone tools (ca. 6%). Cherts make up 23% of the debitage but nearly 30% of the tools. The wide variety in chert colors may or may not reflect a variety of source areas, but the color variation identified by Lothson et al. (1982:Table 16) are maintained here. It is difficult to see any other very distinct patterns in the raw material variability between areas (Table 11) or levels (Appendix A, Tables 19-21). If there were any real exotic (i.e., from distant source areas) material types at 10GG176, it is not apparent from the raw material data. The sources for the cherts and other cryptocrystalline silicates found at the site are currently unknown.

Ground Stone Tools

The general distribution of ground stone items is presented in Table 12; more detailed distribution data for these items appears in Appendix A (Table 22). Of the 72 items recovered, 49 are simply lithic fragments of basalt (n = 42), felsite (n = 2), jasper (n = 2), quartzite (n = 2), and sandstone (n = 1), each with one or more ground surfaces. Many of these may be fire-cracked as evidenced by discolorations and/or crazing lines, though the latter phenomenon also may have resulted from freeze-thaw action. The remaining 23 items consist of three possible basalt cobble hammerstones,

Table 12. Vertical Distribution of Ground Stone Tools by Area.

Level	Area V	Area VI	Area VIII	Area IX	Area X	Total
1	8	1	5	0	1	15
2	5	8	5	0	0	18
3	7	12	4	0	0	23
4	4	5	2	0	0	11
5	0	0	2	1	0	3
6	0	0	0	2	0	2
7-10	0	0	0	0	0	0
Total	24	26	18	3	1	72

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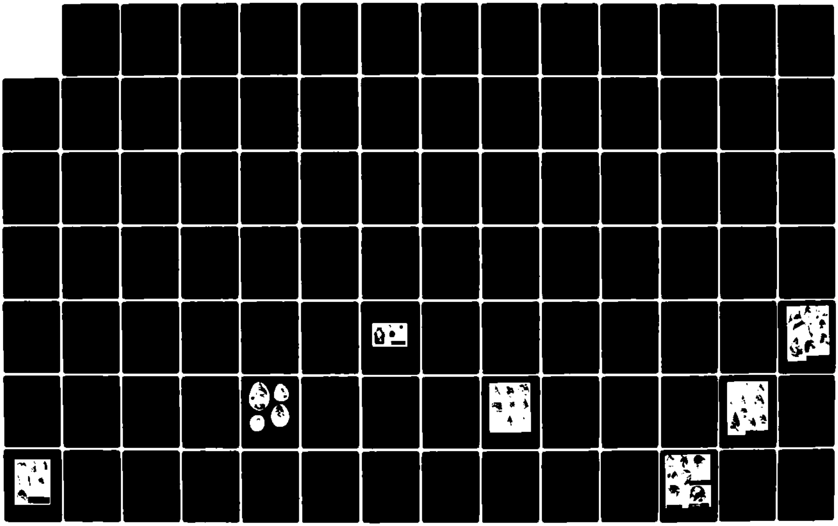

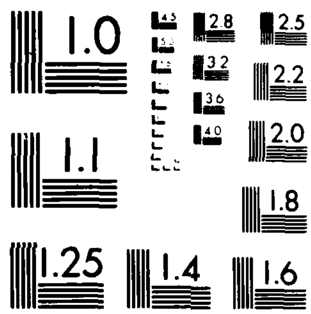

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NATIONAL BUREAU OF STANDARDS 1963 A

four discoidal basalt cobble manos, five cylindrical basalt cobble manos, one basalt grinding slab (mortar?), and 10 "burnishing" or "polishing" stones. Lothson et al. (1982:88) suggest that these "highly polished rectangular and ovate-cylindrical stones" (i.e., small cobbles or pebbles) may have been utilized to polish pottery. They are very similar to the "pebble mortars" noted by Swanson (1972:129) from the Birch Creek locality and are of basalt (n = 6), felsite (n = 3), and sandstone (n = 1). These 10 items found at 10GG176 were not in close proximity to any pottery, but they definitely are stone tools of some grinding or polishing function.

These ground stone items are distributed rather evenly throughout Area V, although most occur in Levels 3 and 4 in the northwest portion of the area and in Levels 1 and 2 in the remainder of Area V. Ground stone items in Area VI appear to be concentrated in Level 3 of several test units; this may or may not represent restricted activity areas. Nowhere in undisturbed context were ground stone items found below Level 4. Area VIII contained a variety of ground stone to a depth of 50 cm, but the deposits are disturbed. Areas IX and X appear to contain particularly few ground stone tools or tool fragments.

The activities represented by the ground stone includes plant and animal food processing (grinding) preparation of pigment (based on related ground stone data from Pavesic and Meatte 1980), lithic reduction (hammerstones), pecking or crushing of plant or animal materials ("hammerstones" could also have been used as pestles), and possibly pottery manufacture (if the polishing stones are accepted as burnishing stones for ceramics). The presence of such ground stone items may be taken as an indication of relatively long duration of occupation, especially where ground stone fragments may be from large, relatively nonportable grinding slabs or metates.

By far basalt is the most common material type used for these tools, and the rest, save two, are of relatively coarse-grained material. The two ground stone fragments of jasper appear to be somewhat of an anomaly.

Ceramics

Only 11 pot sherds were recovered during the 1981 field season, five from Area V (Levels 2 and 3), two from Area VIII (Level 7), and four from Area IX (Levels, 1, 4, and 5). A twelfth pottery item is noted by Lothson et al. (1982:89; Appendix B of this report), but no provenience is offered for it. Two of the sherds from Area V (X-1010, Level 2) were found in the same level with a biface fragment and a ground stone fragment. Smudged interiors on the sherds indicate use in some cooking function. In accordance with Pavesic and Meatte (1980), Lothson et al. (1982:89-90; Appendix B of this report) identified seven of the sherds as Southern Idaho Plain ware and four as Shoshoni ware (cf. Pavesic and Meatte 1980:66-68). Butler (1980:7) notes that the pottery described by Pavesic and Meatte (1980) is not like that found at Wilson Butte Cave. The latter pottery Butler (1980:7) attributes to the Fremont, while the former is more flat-bottomed like most Great Basin Shoshoni wares (Rudy 1953:98). Thus the ceramics tend to support a Shoshoni cultural affiliation for the main occupation at 10GG176 and the date of occupation may be quite late (post-A.D. 1100?), depending on when one chooses to accept the initial presence of the Shoshoni in southern Idaho (cf. Part I of this report).

Summary

Several distinct kinds of cultural material items have been examined separately above. These include historic debris, bone, shell, debitage, chipped stone and ground stone tools, and ceramics. In addition, stratigraphic evidence was used in conjunction with recent historic items to identify severe and general disturbances in Areas VIII and IX. Projectile points and ceramics were used to try to identify the time period and cultural affiliation of the occupation(s) at 10GG176. No radiocarbon nor botanical samples were obtained.

When the elements of the cultural material assemblage from the site are considered together (Table 13), it may be seen that a wide variety of cultural activities are represented. All stages of lithic reduction, from initial or primary core reduction to final tool manufacture, are represented. However, there appears to be an under-representation of primary reduction in obsidian/vitrophyre, the most common raw material represented by chipped stone tools and debitage. This material may have been brought to the site most often in an already partially reduced form. Obsidian /vitrophyre appears to have been the most common tool stone selected for cutting implements, while mostly cherts (cryptocrystalline silicates) were used most often for scraping tools. Basalt is the most common material used for ground stone tools, although it also was used in the chipped stone technology at the site.

The cutting and scraping activities probably were related to processing plant and animal remains for food, clothing, shelter, and to make other implements. Both food (plant and/or animal) materials as well as pigments presumably were crushed and ground. River mussel shell fragments are

Table 13. Cultural Material Inventory by Area and Level.*

Level	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Shell	Historic	Total
			AREA V				
1	113	3	8	13	+	25	162
2	369	17	5	117	+	36	544
3	364	10	7	116	+	8	505
4	321	18	4	326	+	3	672
5	204	14	0	71	+	0	289
6	120	3	0	60	+	0	183
7	22	1	0	0	+	0	23
8	9	0	0	0	0	0	9
9	9	0	0	19	0	0	28
10	0	0	0	7	0	0	7
Total	1531	66	24	729	---	72	2422
			AREA VI				
1	41	3	1	2	+	27	74
2	119	13	8	21	+	42	203
3	209	12	12	27	+	21	281
4	147	9	5	55	+	14	230
5	48	5	0	3	+	2	58
6	21	0	0	1	0	0	22
7	6	0	0	1	0	0	7
8	2	0	0	0	0	0	2
9	4	0	0	0	0	0	4
10	0	0	0	0	0	0	0
Total	597	42	26	110	---	106	881

Table 13. (Continued)

Level	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Shell	Historic	Total
			AREA VIII				
1	8	2	5	1	0	3	19
2	11	1	5	4	0	93	114
3	23	2	4	1	0	55	85
4	69	6	2	11	0	18	106
5	74	3	2	19	0	2	100
6	67	2	0	4	0	2	75
7	48	3	0	4	0	1	56
8	54	2	0	2	0	0	58
9	26	4	0	3	+	5	38
10	0	1	0	0	0	21	22
Total	380	26	18	49	---	200	673
			AREA IX				
1	5	1	0	1	0	8	15
2	57	4	0	4	+	10	75
3	211	5	0	19	+	12	247
4	287	13	0	43	+	8	351
5	244	13	1	43	+	5	306
6	133	5	2	41	+	7	188
7	126	6	0	10	+	12	154
8	30	2	0	2	+	5	39
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Total	1093	49	3	163	---	67	1375

Table 13. (Continued)

Level	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Shell	Historic	Total
			AREA X				
1	6	2	1	1	+	2	12
2	5	1	0	2	0	2	10
3	6	0	0	1	+	0	7
4	2	0	0	7	0	0	9
5	1	0	0	0	0	0	1
6	1	0	0	0	0	0	1
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Total	21	3	1	11	---	4	40
TOTAL	3622	186	72	1062	---	449	5391

*Does not include items from Area VII from Phase II, eight blades, nor 11 pot sherds from Lothson's (1982) artifact descriptions that appear in Appendix B.

common, but no identifiable hinge fragments were found. It is assumed that the mussels of the genus <u>Gonoidea</u> were used based on their general prehistoric prevalence along the Snake River (Lyman 1980). The bone remains are very fragmented and often charred, indicating possible marrow and grease extraction and/or the use of bones for fuel. Cultural material is the most concentrated in Area V, closest to the known housepits at the site (Pavesic and Meatte 1980). Isolated activity areas are expected to have existed in the areas tested, and one of these may have been in the western half of Area VI. Areas VIII and IX are almost totally disturbed, and Area X has very little cultural material. Areas V and VI show disturbance and contamination with historic material down to only ca. 30 cm and 40 cm, respectively, but there are some isolated postholes much deeper in Area V.

The projectile point data do not suggest a definitive date for the major occupation(s) of 10GG176. While there are a very few points that could date as early as 8000-7000 B.P., most point styles date to at least post-A.D. 500 and probably to post-A.D. 1100-1200. Most of the points look as though they are from typical Shoshoni assemblages; however, Butler (1980) suggests that many of them are typical of Great Salt Lake Fremont assemblages, and thus date from A.D. 500 to A.D. 1600-1700.

The pottery from 10GG176 all appears to be Shoshoni products, and some of it may have been made at the site. However, with so few sherds in this sample and the wide range of variation in the Fremont pottery, a Fremont affiliation cannot be discounted. As Butler (1980:10) observes, it will require a much larger sample of artifact types to determine whether the main occupation was solely Shoshoni or Shoshoni preceded by Fremont.

No distinct cultural horizonation was observed at 10GG176, although Lothson et al. (1982) considered Levels 1-3 and 4-9 to be separate components in some sense. This distinction may be only one of disturbance and nondisturbance. Butler (1980) does suggest that some of the different features found by Pavesic and Meatte (1980) may be from different occupations. Thus, instead of a single relatively large village of pithouses, as few as one may have been occupied at a single time. This possibility remains unknown for the moment.

Even with the absence of any features in the Phase II and III investigations, the variety of activities represented in the material culture assemblage in combination with the setting near Riley Spring and Creek would lead one to identify the site at least as a base camp. The presence of pithouses would also be suspected with the density of artifacts becoming greater in their immediate vicinity. Very curiously, there appears to be an absence of large bifacially and unifacially flaked cobble tools for heavy scraping and cutting or chopping activities. These may yet be found if future investigations ever excavate the pithouses and their vicinity.

PART V

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

After three separate phases of archaeological investigations at 10GG-176, there are still several questions about the site's occupation(s) that remain without definitive answers. This is the result of avoiding the most important cultural deposits in the twice-altered construction plans for the hatchery facility. The most important features are the pithouses discovered by Pavesic and Meatte (1980). These were found in Area II (adjacent to Area V), and others may exist in Areas I, III, and IV. All of these areas were avoided by the altered construction plans. Unanswered questions include the precise dates of occupation of the pithouses, whether or not all of them were occupied contemporaneously, and whether the pithouse occupation(s) is solely a Shoshonean cultural manifestation or Fremont followed by Shoshoni occupation. In the absence of absolute dates, the interpretation of the cultural affiliation of the occupation(s) bears directly on the probable dates of occupation. A Fremont affiliation would allow for occupation of at least some of the pithouses as early as A.D. 500; a strictly Shoshonean affiliation would allow for occupation to begin as late as A.D. 1600-1700. A multiple affiliation would have to allow for the entire range of time from A.D. 500 to 1700 for the possible time of occupation of the pithouses. The styles of the projectile points recovered could be either Fremont or Shoshonean, while the pottery essentially looks like Shoshonean products.

Much more data is required to precisely define the cultural affiliation(s) and dates of the main occupation(s) of the site. Evidence of earlier human presence at the site appears to be of much less importance, nearly incidental to the later pithouse occupation(s). As noted by Pavesic and Meatte (1980:75) and Butler (1980:13), there are no published data on late prehistoric houses in southern Idaho. Short of large-scale archaeological excavations at 10GG176, it was purdent to redesign the construction plans for the hatchery to avoid this cultural resource that could be crucial to understanding the prehistory of southern Idaho. By any estimation, the intact pithouses and their immediate vicinity are of National Register quality as defined in 36 CFR 60.6.

A wide variety of cultural activities is represented by the assemblage collected from the site in this third phase of investigations there. Although no additional distinct cultural features were discovered in the five areas tested, there is evidence of numerous subsistence activities. These include most stages of lithic reduction for tool manufacturing, hunting, plant and animal food processing with both chipped and ground stone tools, and possibly pottery manufacturing but certainly pottery use. The distribution of this evidence varies greatly in the areas tested, partly as a result of the distribution of relatively localized activity areas probably associated with the pithouse occupation(s) and partly as a result of historic disturbance of the deposits. However, only the west half of Area VI is suggested as a relatively discrete activity area, and this not strongly so. No cultural components are distinguishable horizontally or vertically in the areas tested away from the pithouses.

In terms of the National Register criterion of the potential to yield significant information (36 CFR 60.6), the designated areas of the site tested for this phase of investigation are considered as follows:

1. Area V has the greatest potential to yield further information due its proximity to the known pithouses. The westernmost portion of Area V, in fact, is immediately adjacent to the pithouses, and its northwesternmost portion contains the densest amount of cultural material found in this testing program. Cultural material frequency drops off dramatically to the east and south where the new pipeline is to be placed. Most of the upper 30 cm of the deposits in this area has been disturbed historically with some isolated posthole disturbances to greater depths. Potential for further significant archaeological information is high to low on any west-to-east line through the area.
2. Area VI may contain a prehistoric activity area in its western half, but the frequency of cultural material is much less than in Area V. The eastern portion of the area is currently under asphalt and may or may not contain additional habitation features. Disturbance of deposits in Area VI not under asphalt is only slightly deeper and more extensive than in Area V. The new pipeline through the tested portion of Area VI has little potential to impact any unknown significant cultural resources.
3. Area VIII is a very badly disturbed portion of the site that contains relatively little cultural material. Intact cultural deposits may lie deeply buried in isolated areas here, but it is unlikely. Potential to yield significant archaeological information for Area VIII is very low.

4. Area IX consists almost entirely of redeposited sediments presumably from original construction of the concrete raceways at the hatchery. There is a substantial quantity of cultural material here, but it all appears to be in a highly disturbed context. Intact cultural deposits may lie deeply buried in isolated areas, but it is unlikely. Potential to yield additional significant archaeological information for Area IX is very low.
5. Area X is undisturbed but contains extremely little cultural material. It is the farthest removed of all tested areas from the pithouses. This area's potential to yield significant archaeological information is very low.

Area VII was included in the testing program of the second phase of investigations at 10GG176 (Lothson and Virga 1981). There were no cultural features and only a moderate amount of cultural material in this area. Its potential to yield significant archaeological information is considered very low.

Although the site's boundaries are not well-defined, it does extend into all of the areas tested, except perhaps for Area X. The principal occupation area of the site has been avoided successfully. The remaining questions about the site's occupation(s) can be addressed only through a detailed investigation by block excavations of the pithouses. It is very doubtful that any further investigations in the impact areas would produce any useful archaeological information beyond what is already known.

Recommendations

It is recommended first that the pithouses and their immediate vicinity be avoided by any construction at the site. Water pipelines currently in place for irrigating in Areas I through V should be shut off permanently to avoid any further deterioration of floral and faunal remains that may be present there (cf. Lothson et al. 1982:105). Construction of new pipelines should follow their corridors as closely as possible, especially in Areas V and VI. Construction of the settling pond in Area X should proceed without concern for cultural resources there. The presence of an archaeologist to monitor construction is recommended as well, primarily to ascertain that no unexpected cultural features are encountered.

Although not currently planned, future alterations of the hatchery facilities may require mitigation of the pithouses at the site. These pithouses contain information significant to understanding southern Idaho prehistory. The questions of cultural affiliation and succession at the site could contribute to resolving similar questions for southern Idaho in general. Additional questions that should be addressed in any future excavations include the seasonality of occupation, differences and similarities in house plans, and features and activities associated with the pithouses. These are unknown aspects of late prehistoric pithouses in southern Idaho. Flotation, pollen/biosilicate, fine-screen recovery, and radiocarbon sampling should be pursued in any future investigations of the pithouses. Until such investigations can be pursued, either by necessity or desire, this portion of the site should remain protected. Lastly then, it is recommended that efforts be made to nominate site 10GG176 to the National Register of Historic Places.

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APPENDIX A

CULTURAL MATERIAL INVENTORIES

BY TEST UNIT AND LEVEL

Table 14. Cultural Material Inventory by Area and Test Unit.

Test Unit	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Historic	Total
AREA V						
1001	5	0	0	0	0	5
1002	1	0	0	0	0	1
1003	20	0	0	8	6	34
1004	10	0	0	18	0	28
1006	2	0	0	0	0	2
1008	2	1	0	0	0	3
1009	14	1	1	0	0	16
1010	6	0	0	0	0	6
1011	8	1	0	0	0	9
1012	3	0	0	2	0	5
1013	9	0	0	0	0	9
1014	7	2	1	2	0	12
1015	7	0	0	3	1	11
1016	7	1	1	7	2	18
1019	2	1	0	0	3	6
1020	5	0	0	0	2	7
1022	2	0	0	0	0	2
1023	1	0	1	0	2	4
1024	11	0	1	1	2	15
1025	6	0	1	0	1	8
1026	3	0	1	0	0	4
1027	4	1	0	3	0	8
1028	7	0	0	1	0	8
1029	18	1	1	5	4	29
1030	16	0	0	5	1	22
1031	18	0	1	7	6	32
1032	27	1	0	5	2	35
1033	22	0	1	9	1	33
1034	17	1	0	2	1	21
1035	26	1	0	0	2	29

Table 14. (Continued)

Test Unit	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Historic	Total
			AREA V (Continued)			
1036	26	0	1	3	0	30
1037	7	0	0	1	1	9
1038	5	0	0	0	3	8
1039	28	0	0	4	2	34
1040	26	3	0	14	0	43
1041	37	1	0	0	3	41
1042	25	3	0	10	10	48
1043	44	1	1	11	2	59
1044	40	2	1	24	1	68
1045	106	2	1	24	0	133
1046	149	8	4	44	1	206
1047	13	0	0	3	0	16
1048	20	0	2	2	0	24
1049	6	0	0	0	1	7
1050	5	2	0	4	0	11
1051	114	4	2	150	7	277
1052	220	10	1	263	3	497
1053	123	7	0	25	0	155
1054	102	6	1	17	1	127
1057	149	5	0	52	1	207
Total	1531	66	24	729	72	2422
			AREA VI			
1	54	5	0	26	1	86
2	47	3	0	39	1	90
3	10	1	0	6	15	32
4	5	1	0	0	3	9
406	104	5	3	10	0	122
407	63	6	5	7	0	81
419	42	1	4	0	1	48
420	48	3	0	0	0	51

Table 14. (Continued)

Test Unit	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Historic	Total
AREA VI (Continued)						
428	24	0	0	1	0	25
429	3	0	0	0	1	4
440	23	3	1	0	0	27
441	10	2	1	0	1	14
456	14	2	0	0	0	16
457	15	1	0	0	0	16
468	7	3	0	0	0	10
469	13	0	0	0	0	13
488	1	0	0	0	0	1
489	1	0	0	2	0	3
491	14	0	1	1	0	16
492	16	2	6	1	6	31
500	2	1	0	0	3	6
501	0	0	0	0	1	1
503	8	0	1	0	1	10
504	8	1	0	0	0	9
538	0	0	0	6	[illegible]	11
549	1	0	1	1	2	5
550	3	0	0	4	2	9
593	9	0	0	2	12	23
594	14	0	2	1	11	28
607	6	0	0	2	12	20
608	2	0	0	0	8	10
649	6	1	1	0	3	11
650	5	0	0	0	7	12
663	4	0	0	1	8	13
664	15	1	0	0	2	18
Total	597	42	26	110	106	881

Table 14. (Continued)

Test Unit	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Historic	Total
			AREA VIII			
103	10	0	0	2	1	13
104	5	0	2	3	2	12
105	19	2	2	14	9	46
106	53	3	3	18	3	80
109	1	0	1	0	0	2
111	1	0	1	0	0	2
112	1	0	1	1	0	3
115	2	0	0	0	0	2
116	23	0	1	3	0	27
130	15	3	0	0	1	19
131	17	0	2	0	4	23
144	19	1	0	0	9	29
145	16	2	0	0	2	20
182	22	2	1	3	10	38
183	11	1	0	1	0	13
190	18	1	0	0	36	55
191	22	4	0	2	6	34
225	37	1	0	0	34	72
226	21	2	2	1	30	56
239	28	1	2	1	29	61
240	31	1	0	0	10	42
327	3	0	0	0	9	12
335	3	2	0	0	1	6
336	2	0	0	0	4	6
Total	380	26	18	49	200	673

Table 14. (Continued)

Test Unit	Debitage	Chipped Stone Tools	Ground Stone Tools	Bone	Historic	Total
			AREA IX			
2000	6	1	0	1	15	23
2001	11	1	0	1	20	33
2002	3	0	0	0	0	3
2004	133	1	0	8	0	142
2005	210	7	1	12	1	231
2006	44	6	2	3	0	55
2007	137	10	0	28	1	176
2008	116	4	0	29	0	149
2009	154	11	0	59	1	225
2010	84	3	0	6	15	108
2011	83	0	0	4	0	87
2012	32	2	0	3	12	49
2013	80	3	0	9	2	94
Total	1093	49	3	163	67	1375
			AREA X			
3000	3	0	0	1	2	6
3001	3	1	0	0	2	6
3009	1	0	0	0	0	1
3010	1	0	0	7	0	8
3012	4	1	1	3	0	9
3013	4	0	0	0	0	4
3016	0	1	0	0	0	1
3018	3	0	0	0	0	3
3019	2	0	0	0	0	2
Total	21	3	1	11	4	40
TOTAL	3622	186	72	1062	449	5391

Table 15. Historic Cultural Material Inventory by Area, Test Unit, and Level.

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					Area V						
1003	1	2	3								6
1015	1										1
1016		2									2
1019	1	2									3
1020		2									2
1023	1		1								2
1024	2										2
1025	1										1
1029	3	1									4
1030	1										1
1031	2	4									6
1032	1	1									2
1033	1										1
1034	1										1
1035	1	1									2
1037	1										1
1038	2	1									3
1039	1	1									2
1041		3									3
1042	3	7									10
1043		2									2
1044			1								1
1046			1								1
1049		1									1
1051	1	3		3							7
1052		1	2								3
1054		1									1
1057		1									1
Total	25	36	8	3							72

Table 15. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					Area VI						
1	1										1
2		1									1
3	6	9									15
4		3									3
419				1							1
429		1									1
441					1						1
492		3	3								6
500	1	2									3
501	1										1
503		1									1
538	4		1								5
549	2										2
550			1	1							2
593	6	4	2								12
594	3		2	6							11
607	1	3	6	1	1						12
608	2		3	3							8
649		3									3
650		7									7
663		5	3								8
664				2							2
Total	27	42	21	14	2						106
					AREA VIII						
103	1										1
104		2									2
105		2	6	1							9
106		2		1							3
130		1									1

Table 15. (Continued)

Test Unit	Level 1	2	3	4	5	6	7	8	9	10	Total
					AREA VIII (Continued)						
131	1	3									4
144		6	3								9
145		1	1								2
182		2		5	2	1					10
190			8	8						20	36
191		1		3					2		6
225		20	11						3		34
226		24	6								30
239		21	8								29
240		8	1							1	10
327			8				1				9
335	1										1
336			3			1					4
Total	3	93	55	18	2	2	1		5	21	200
					AREA IX						
2000	3		2	3	1	3	3				15
2001	1		6	1	4		5	3			20
2005		1									1
2007		1									1
2009		1									1
2010	2	6	1	3		3					15
2012	2	1	3	1		1	4				12
2013								2			2
Total	8	10	12	8	5	7	12	5			67
					AREA X						
3000	2										2
3001	2										2
Total	4										4
TOTAL	67	181	96	43	9	9	13	5	5	21	449

Table 16. Bone/Bone Fragment Inventory by Area, Test Unit, and Level.

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA V						
1003		1								7	8
1004									18		18
1012	2										2
1014		1		1							2
1015			3								3
1016		3	4								7
1024			1								1
1027		3									3
1028		1									1
1029	1	3	1								5
1030	1	3	1								5
1031		2	4	1							7
1032		1	4								5
1033	3	5		1							9
1034	1	1									2
1036		2			1						3
1037		1									1
1039		1	2		1						4
1040		4	5	3	2						14
1042		10									10
1043			5	6							11
1044		3	9	10	2						24
1045	1	10	7	5					1		24
1046		12	9	8	7	8					44
1047		1	1	1							3
1048		1			1						2
1050		4									4
1051	3	19	18	106	4						150
1052	1	19	39	174	18	12					263
1053		1	2	1	7	14					25
1054		2		2	10	3					17
1057		3	1	7	18	23					52
Total	13	117	116	326	71	60		19		7	729

Table 16. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA VI						
1				26							26
2		1	15	23							39
3		6									6
406		2		3	3	1	1				10
407	2		3	2							7
428		1									1
489		2									2
491			1								1
492			1								1
538		6									6
549		1									1
550			4								4
593		1		1							2
594			1								1
607			2								2
663		1									1
Total	2	21	27	55	3	1	1				110
					AREA VIII						
103							2				2
104						3					3
105		1		4	9						14
106				7	9	1	1				18
112	1										1
116		2			1						3
182								2	1		3
183							1				1
191									2		2
226			1								1
239		1									1
Total	1	4	1	11	19	4	4	2	3		49

Table 16. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA IX						
2000						1					1
2001								1			1
2004			1	3	3	1					8
2005	1		1	1		4	5				12
2006					3						3
2007		2	1	1	16	8					28
2008			6	11	4	8					29
2009		2	7	22	16	8	4				59
2010			2			3		1			6
2011			1	1		2					4
2012					1	2					3
2013				4		4	1				9
Total	1	4	19	43	43	41	10	2			163
					AREA X						
3000			1								1
3010				7							7
3012	1	2									3
Total	1	2	1	7							11
TOTAL	18	148	164	442	136	106	15	4	22	7	1062

Table 17. Presence of Shell Fragments by Area, Test Unit, and Level.

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA V						
1032	+										
1033	+	+									
1037			+								
1041		+									
1042			+								
1043		+									
1045							+				
1046		+	+	+	+	+					
1050		+									
1051		+	+	+							
1052		+	+								
1053		+		+	+						
1054		+		+							
1057		+	+			+					
Total	2	10	6	5	3	2	1				29
					AREA VI						
1	+		+	+	+						
406				+	+						
407			+	+							
420		+	+								
456			+								
457		+									
469		+	+								
503			+								
594			+								
608			+	+							
649		+									
663			+								
664				+							
Total	1	4	9	5	2						21

Table 17. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
AREA VIII											
183									+		
225									+		
Total									2		2
AREA IX											
2004		+	+	+	+						
2005		+				+	+				
2007		+			+						
2008			+	+	+	+	+	+			
2009		+	+	+	+	+	+	+			
2010				+							
2011				+	+	+					
2013		+	+	+	+	+	+				
Total		5	4	6	6	5	4	2			32
AREA X											
3013	+										
3018			+								
Total	1		1								2
TOTAL	4	19	20	16	11	7	5	2	2	0	86

Table 18. Inventory of Chipped Stone Tools by Area, Test Unit, and Level.

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA V						
1008	1S										1
1009		1B									1
1011	1P										1
1014		2P									2
1016		1B									1
1019		1P									1
1027			1B								1
1029		1P									1
1032			1P								1
1034				1B							1
1035			1B								1
1040				1B/2P							3
1041			1P								1
1042	1P	2P									3
1043			1P								1
1044		1C		1P							2
1045			1C			1B					2
1046			2P	2S	2C/2M						8
1050		1M		1P							2
1051		2P		1P/1S							4
1052			2M/1P 1B/2C	2P/1S		1P					10
1053		1B/1P 1S	1B		3P						7
1054		1C	1P	1P	1P	1P	1S				6
1057		1S		1P	1B/2P						5
Total	3	17	16	15	11	3	1				66

Table 18. (Continued)

Test Unit	Level 1	2	3	4	5	6	7	8	9	10	Total
AREA VI											
1	2C	1P	1C		1P						5
2		1B/1C		1C							3
3		1P									1
4					1S						1
406			1M/2P 1B		1C						5
407			1B/1C	2B/2M							6
419			1B								1
420		1P	1C	1M							3
440		2B		1C							3
441		1M/1B									2
456			1M	1S							2
457		1B									1
468		2C			1M						3
492			2P								2
500	1B										1
503				1B							1
649					1P						1
664		1M									1
Total	3	13	12	9	5						42
AREA VIII											
105				1P	1P						2
106		1B	1M					1S			3
130			1P	1P	1B						3
144				1C							1
145				2C							2
182							1M	1M			2
183							1C				1
190										1M	1
191									2M/1S 1C		4

Table 18. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					Area VIII (Continued)						
225						1C					1
226				1M			1M				2
239					1M						1
240	1P										1
335	1S					1M					2
Total	2	1	2	6	3	2	3	2	4	1	26
					AREA IX						
2000								1P			1
2001						1M					1
2004					1B						1
2005					2B		2M/1P 2C				7
2006	1B	1P	1B		1S/1M			1B			6
2007		1P	2M	1M/1D 2B/1P	1M/1B						10
2008				2S/1C		1M					4
2009		1P	1P	1M/1P 1S/2B	1B	1B/1S	1B				11
2010					1M/1C	1B					3
2012					2M						2
2013		1P	1M		1P						3
Total	1	4	5	13	13	5	6	2			49
					AREA X						
3001	1P										1
3012	1B										1
3016		1P									1
Total	2	1									3
TOTAL	11	36	29	46	35	10	10	4	4	1	186

S = Scraper C = Core B = Biface and biface fragment M = Modified flake
P = Projectile point and projectile point fragment D = Drill/perforator

Table 19. Debitage Inventory by Area, Test Unit, and Level.

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
AREA V											
1001	3	1	1								5
1002	1										1
1003	4	13	1		1				1		20
1004	2	4	4								10
1006		2									2
1008	2										2
1009	1	10	1	2							14
1010	3	1	2								6
1011	3	5									8
1012	2	1									3
1013	6	3									9
1014	1	4	2								7
1015		3	4								7
1016		3	4								7
1019		2									2
1020	1	4									5
1022		1		1							2
1023			1								1
1024	3	3	2	2	1						11
1025	4	1						1			6
1026		2		1							3
1027		4									4
1028	1	5	1								7
1029	2	12	4								18
1030	4	8	4								16
1031	4	8	3			2	1				18
1032	4	8	8			4	2	1			27
1033	5	7	7	3							22
1034	8	5	2	1	1						17
1035	4	10	10	2							26
1036	4	10	4	7	1						26
1037		3	3		1						7

Table 19. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA V (Continued)						
1038		2			2	1					5
1039	4	11	10	1	2						28
1040	4	6	8	2	6						26
1041	4	17	16								37
1042	2	16	7								25
1043		13	25	2	2	1	1				44
1044		6	21	6	6	1					40
1045	2	22	26	14	19	12	4	4	3		106
1046	5	16	38	23	34	12	13	3	5		149
1047	3	5	2	2	1						13
1048	2	5	7	5			1				20
1049	1	2	3								6
1050			5								5
1051	7	26	10	66	5						114
1052	2	16	54	117	19	12					220
1053	1	32	20	10	36	24					123
1054		13	17	26	20	26					102
1057	4	18	27	28	47	25					149
Total	113	369	364	321	204	120	22	9	9		1531
					AREA VI						
1	8	23	15	2	4	2					54
2		15	23	6	1	2					47
3		1	2	6	1						10
4		2	2			1					5
406	1	4	29	41	19	6	3	1			104
407	4	3	22	20	10	3	1				63
419		13	12	14	2		1				42
420	1	4	21	13	2	5		1	1		48
428	5	6	3	10							24
429	1		2								3
440	5	4	7	7							23
441		4	4						2		10

Table 19. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA VI (Continued)						
456	3	5	4	1					1		14
457	6	6	3								15
468	2	4	1								7
469		4	7	2							13
488			1								1
489			1								1
491		2	10	2							14
492		1	15								16
500		2									2
501											
503		8									8
504		2	2	3	1						8
538											
549						1					1
550		1		2							3
593			7	2							9
594		1	2	9	2						14
607		1	4	1							6
608	1			1							2
649			4		2						6
650		1		3		1					5
663			1	2			1				4
664	4	2	5		4						15
Total	41	119	209	147	48	21	6	2	4		597

Table 19. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA VIII						
103	2	2		2			4				10
104	2					3					5
105			1	4	6	7		1			19
106				13	17	8	6	8	1		53
109		1									1
111	1										1
112				1							1
115	2										2
116					21	2					23
130		1	2	10	1	1					15
131		1	5	10				1			17
144				9	7	1	2				19
145			1	8	3	2	1	1			16
182		1			1		6	9	5		22
183					2		6	3			11
190		1	2		3		2	10			18
191							3	8	11		22
225		1	8		1	22	4		1		37
226		1	1	3	2	7	6	1			21
239			3	3	5	9	4	4			28
240		2		1	3	5	4	8	8		31
327				3							3
335	1				2						3
336				2							2
Total	8	11	23	69	74	67	48	54	26		380

Table 19. (Continued)

Test Unit	Level 1	2	3	4	5	6	7	8	9	10	Total
					AREA IX						
2000					5			1			6
2001				2	3	3	2	1			11
2002		2	1								3
2004	3	6	54	25	41	4					133
2005	2	5	4	16	52	42	89				210
2006		2	8	3	9	3	9	10			44
2007		18	5	51	36	22	1	4			137
2008			32	51	17	8	5	3			116
2009		16	36	47	34	12	7	2			154
2010			24	15	20	15	7	3			84
2011		1	19	44	6	7	4	2			83
2012		1	10	2	9	10					32
2013		6	18	31	12	7	2	4			80
Total	5	57	211	287	244	133	126	30			1093
					AREA X						
3000		1	2								3
3001	1		1	1							3
3009				1							1
3010		1									1
3012	1	3									4
3013	4										4
3018			3								3
3019					1	1					2
Total	6	5	6	2	1	1					21
TOTAL	173	561	813	826	571	342	202	95	39		3622

Table 20. Distribution of Debitage: Size Grades by Area and Test Unit.

Test Unit	Size Grade (mm)										Total
	5	10	15	20	25	30	35	40	45	50+	
AREA V											
1001		1		3	1						5
1002			1								1
1003	1	3	12	3	1						20
1004	2	6	1	1							10
1006		1		1							2
1008		1	1								2
1009		6	5	1	2						14
1010	1	3	1	1							6
1011		1	5	1	1						8
1012		3									3
1013	1	4	3	1							9
1014		3	3	1							7
1015		3	2	2							7
1016	3	2	2								7
1019			1		1						2
1020		2	1		1			1			5
1022		1		1							2
1023					1						1
1024		4	3	3		1					11
1025	1	1	3	1							6
1026	1	1	1								3
1027		1	3								4
1028		5		2							7
1029	1	6	10	1							18
1030		7	4	4	1						16
1031		3	8	4		2	1				18
1032	1	9	8	5	3	1					27
1033		12	4	4	2						22
1034	7	5	4	1							17
1035		12	10	3	1						26
1036	1	11	10	3	1						26

Table 20. (Continued)

Test Unit	Size Grade (mm)										Total
	5	10	15	20	25	30	35	40	45	50+	
					AREA V (Continued)						
1037		2	2	1	2						7
1038		3	1			1					5
1039	1	8	12	6						1	28
1040		11	11	3		1					26
1041		10	17	6	3	1					37
1042		11	10	2	2						25
1043	1	17	12	11	1	1	1				44
1044		12	15	8	4	1					40
1045	5	50	29	16	3	2	1				106
1046	4	91	35	8	7	3	1				149
1047	1	6	4		1	1					13
1048	1	12	3	2	2						20
1049		1	3	2							6
1050			5								5
1051	1	34	34	21	10	7	4	2	1		114
1052	4	90	73	31	17	2		2	1		220
1053		43	45	21	8	5	1				123
1054	1	42	40	14	4	1					102
1056											0
1057	8	52	51	26	7	1	3	1			149
Total	47	612	508	225	87	31	12	6	2	1	1531
					AREA VI						
1	6	19	16	6	5	2					54
2	1	5	19	12	5	3	2				47
3	1	4	2	3							10
4		2		2			1				5
406	1	32	49	12	5	3	1			1	104
407		14	31	10	6	1	1				63
419		9	15	7	4	3	3			1	42
420		15	16	7	7	1		2			48

Table 20. (Continued)

Test Unit	Size Grade (mm)										Total
	5	10	15	20	25	30	35	40	45	50+	
					AREA VI (Continued)						
428	1	6	8	5	2	1	1				24
429				2			1				3
440		4	12	3	4						23
441	1	5	2		1		1				10
456		5	3	3	1	2					14
457		4	5	4		2					15
468		1	1	4		1					7
469		2	6	5							13
488				1							1
489			1								1
491		6	6	2							14
492	2	6	4		2		2				16
500			1	1							2
502	1	1	4	2							8
503		1	2	3	1	1					8
549			1								1
550		2	1								3
593		3	3		1	1	1				9
594		5	5	2	1		1				14
607		2	2	2							6
608		1		1							2
649		4		1		1					6
650		2	2		1						5
663			1	2	1						4
664		3	2	5	4	1					15
Total	14	163	220	107	51	23	15	2		2	597

Table 20. (Continued)

Test Unit	Size Grade (mm)										Total
	5	10	15	20	25	30	35	40	45	50+	
					AREA VIII						
103		5	1	3		1					10
104		1	3	1							5
105		7	8	2	1		1				19
106	2	21	23	4	2	1					53
109			1								1
111		1									1
112		1									1
115		2									2
116		6	13	4							23
130	1	8	3	3							15
131	1	6	4	3	1		2				17
144		6	8	3	2						19
145		8	6	1			1				16
182		6	10	2	2	1	1				22
183	2	1	6	2							11
190	1	6	3	6	1	1					18
191		3	14	4	1						22
225	11	12	7	6					1		37
226	1	7	7	6							21
239		9	10	3	4	2					28
240	1	16	9	3	2						31
327			3								3
335		1	1		1						3
336		1			1						2
Total	20	134	140	56	18	6	5		1		380

Table 20. (Continued)

Test Unit	Size Grade (mm)										Total
	5	10	15	20	25	30	35	40	45	50+	
					AREA IX						
2000			2	1	1		2				6
2001	1	4	2	2		1	1				11
2002		1		1	1						3
2004	4	51	38	16	18	5	1				133
2005		106	51	31	12	7	2		1		210
2006		13	8	14	1	4	2		1	1	44
2007		42	35	23	16	11	5	3	2		137
2008		55	27	19	9	5	1				116
2009	2	50	50	30	17	2	1	1	1		154
2010		35	28	15	5	1					84
2011		41	25	5	6	5			1		83
2012		7	7	8	3	4	1	1	1		32
2013		20	25	19	6	5			2	3	80
Total	7	425	298	184	95	50	16	5	9	4	1093
					AREA X						
3000		1			1	1					3
3001		2							1		3
3009				1							1
3010								1			1
3012		1	2	1							4
3013			2		1					1	4
3018			3								3
3019		2									2
Total		6	7	2	2	1		1	1	1	21
TOTAL	88	1340	1173	574	253	111	48	14	13	8	3622

Table 21. Distribution of Debitage: Raw Material Types by Area and Test Unit.

Test Unit	Obsidian	Red Chert	White Chert	Green Chert	Grey Chert	Basalt	Brown Chert	Jasper	Opal	Chalcedony	Pink Chert	Buff Chert	Total
AREA V													
1001	4	1											5
1002	1												1
1003	15		2		1				1			1	20
1004	6		1			3							10
1006	2												2
1008	1						1						2
1009	8					4		1			1		14
1010	3		2								1		6
1011	4		2			2							8
1012	3												3
1013	6					2					1		9
1014	4						1				1	1	7
1015	5		1			1							7
1016	6						1						7
1019	1											1	2
1020	4					1							5
1022						2							2
1023						1							1
1024	8					1		1		1			11
1025	3						1	2					6
1026	3												3
1027	4												4
1028	5		1								1		7
1029	7	1	3		2	1				2	1	1	18
1030	7	2			1	1	1	2	1			1	16
1031	9	1				3		2	1	1		1	18
1032	10	2	1			7	2	1				4	27
1033	13		3		1	3	1				1		22
1034	9	1	3		1	1	1	1					17

Table 21. (Continued)

Test Unit	Obsidian	Red Chert	White Chert	Green Chert	Grey Chert	Basalt	Brown Chert	Jasper	Opal	Chalcedony	Pink Chert	Buff Chert	Total
AREA V (Continued)													
1035	18		1		3		1			3			26
1036	19		2		1		1			1	1	1	26
1037	4	1	2										7
1038	3					1		1					5
1039	16		3		2	2	1	4					28
1040	15		3		1	3	1	1		1	1		26
1041	23	1	1		3	2	3	1	1		2		37
1042	12		3	1	3	2	3			1			25
1043	34	1	2		1	1		1		2	2		44
1044	23	1	7		6		1	1		1			40
1045	69	7	10		6	1	5	5			1	2	106
1046	115	5	5	1	1	11	3	6			1	1	149
1047	10					2	1						13
1048	8	2	5		2	1				1	1		20
1049	2		1			1	2						6
1050	2					2		1					5
1051	35	9	5	2	19	12		20		6		6	114
1052	67	13	28	1	27	32	25	23	3		1		220
1053	56	7	11		13	9	10	16				1	123
1054	66	8	8	2	3	1	2	8			1	3	102
1057	58	7	14	5	10	2	18	21		8	2	4	149
Total	806	70	130	12	107	118	86	119	7	28	20	28	1531
AREA VI													
1	39	3	2	1	6	2				1			54
2	18	3	1		21	2	1					1	47
3	8		1			1							10
4	4		1										5
406	67	4	2		5	15	3	6		1	1		104

Table 21. (Continued)

Test Unit	Obsidian	Red Chert	White Chert	Green Chert	Grey Chert	Basalt	Brown Chert	Jasper	Opal	Chalcedony	Pink Chert	Buff Chert	Total
AREA VI (Continued)													
407	43	2	1		7	6	2	2					63
419	25	1	1	1	5	6	1	2					42
420	34		1		4	8						1	48
428	18	1			1	3						1	24
429	2					1							3
440	13	1			2	2	1	3		1			23
441	7		1		1	1							10
456	11		1			2							14
457	10				1	3					1		15
468	1	1				2	2	1					7
469	11		1			1							13
488			1										1
489			1										1
491	9	1			1		1	1			1		14
492	5	2	4		1	2					2		16
500	1							1					2
502	3		3		1						1		8
503	3				1	1				1	1	1	8
549	1												1
550	1		2										3
593	5	1				3							9
594	10	1	1			1				1			14
607	3					1		1			1		6
608						1			1				2
649	4		1			1							6
650	5												5
663	4												4
664	9				1	5							15
Total	374	21	26	2	58	70	11	17	1	5	8	4	597

Table 21. (Continued)

Test Unit	Obsidian	Red Chert	White Chert	Green Chert	Grey Chert	Basalt	Brown Chert	Jasper	Opal	Chalcedony	Pink Chert	Buff Chert	Total
AREA VIII													
103	5				1	4							10
104	4				1								5
105	8	2				8					1		19
106	21	11			8	9	2				2		53
109						1							1
111	1												1
112		1											1
115			1				1						2
116	15		1		1	5	1						23
130	5	2			3	5							15
131	5	3			3	5					1		17
144	7	2				6	2	2					19
145	8	1			3	4							16
182	9	1	1		2	5	3					1	22
183	5					2	1			1	2		11
190	7	2		1		6	1	1					18
191	7	3	1			8	1	2					22
225	9	5			5	13	1	3	1				37
226	3	1	4			7		4			2		21
239	10	5	1			7	1	2				2	28
240	17		1			9		4					31
327	1	1	1										3
335		1			1	1							3
336						2							2
Total	147	41	11	1	28	107	14	18	1	1	8	3	380

Table 21. (Continued)

Test Unit	Obsidian	Red Chert	White Chert	Green Chert	Grey Chert	Basalt	Brown Chert	Jasper	Opal	Chalcedony	Pink Chert	Buff Chert	Quartzite	Total
							AREA IX							
2000	2		1		1	2								6
2001	8		2			1								11
2002	2		1											3
2004	109	4	9	1	1	5	3	1						133
2005	163	4	6	3	3	19	3	3			2	4		210
2006	30	1	2		1	7			1			2		44
2007	103	1	12		5	10	2	1			2	1		137
2008	93		1	1	8	3	4	5			1			116
2009	117	3	5	1	5	14	4	1		1		3		154
2010	64	1	3	1	1	6		5		1		2		84
2011	69	2	5		3	4								83
2012	24	1	1			1	2	2				1		32
2013	62		5		2	3	3	4					1	80
Total	846	17	53	7	30	75	21	22	1	2	5	13	1	1093
							AREA X							
3000	1							1		1				3
3001	2				1									3
3009												1		1
3010							1							1
3012	2	1					1							4
3013	3					1								4
3018	2	1												3
3019		1	1											2
Total	10	3	1		1	1	2	1		1		1		21
TOTAL	2183	152	221	22	224	371	134	177	10	37	41	49	1	3622

Table 22. Inventory of Ground Stone Tools by Area, Test Unit, and Level.

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA V						
1009	1H										1
1014	1F										1
1016		1F									1
1023		1F									1
1024		1B									1
1025	1F										1
1026	1F										1
1029	1F										1
1031	1F										1
1033	1F										1
1036				1F							1
1043		1F									1
1044				1H							1
1045			1B								1
1046			4F								4
1048	1F		1F								2
1051		1B		1B							2
1052			1F								1
1054				1F							1
Total	8	5	7	4							24
					AREA VI						
406		3F									3
407			1F/2B	1F/1B							5
419		3F	1F								4
440	1F										1
441				1B							1
491			1F								1
492		1F	3F/1B 1MD								6
503		1F									1

Table 22. (Continued)

Test Unit	Level										Total
	1	2	3	4	5	6	7	8	9	10	
					AREA VI (Continued)						
549			1F								1
594				1H/1S							2
649			1F								1
Total	1	8	12	5							26
					AREA VIII						
104	2MD										2
105		2F									2
106	1MC			1F	1F						3
109		1B									1
111		1F									1
112	1F										1
116					1F						1
131	1MC		1F								2
182				1F							1
226			1F/1MC								2
239		1MD	1MC								2
Total	5	5	4	2	2						18
					AREA IX						
2005						1MC					1
2006					1F	1F					2
Total					1	2					3
					AREA X						
3012	1F										1
TOTAL	15	18	23	11	3	2					72

F = Fragment H = Hamerstone/pestle MD = Mano (discoid ?)

MC = Mano (cylindrical ?) B = Burnishing stone? S = Slab/mortar

APPENDIX B

CULTURAL MATERIAL DESCRIPTIONS

by

Gordon A. Lothson

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CULTURAL MATERIAL DESCRIPTIONS

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PREFACE

The following artifact descriptions are taken nearly verbatim from Lothson et al. (1982:50-90). Minimal editing has been done to this text, primarily in the form of correcting typographical errors in the draft. Headings and subheadings have been reformatted to present the descriptions at their proper levels of organization. Metric and provenience data have been reorganized. In several instances, sample sizes presented here do not match the sample sizes presented elsewhere in this report; the descriptions here include a small number of additional nondiagnostic items that are not considered in the other data presentations. Because the data tables from the draft have been reworked, references to data tables in the draft's artifact descriptions have been replaced with references to the new data tables where comparable information may be found. Likewise, figure references have been changed for this manuscript, but figure references are to the same photos as indicated in the draft original. Since figure citations for these photos are from the artifact descriptions, unnecessary descriptive terms have been deleted from the original figure captions. Also, more items appear on a single page here than was intended by Lothson. The altered table and figure references are denoted by brackets ([]), as are some miscellaneous editorial comments that pertain to this presentation. Appendix B has been kept as faithful as possible to the original draft as prepared by Lothson with the help of Linse and Virga.

Daniel G. Landis

HISTORIC ARTIFACTS

The identifiable historic materials collected from the site consist exclusively of twentieth century artifacts [Figure 24]. No historic fur trade materials have been found in any of the excavation units nor at any of the nearby localities in the Hagerman Valley. Iron fragments, marbles, round wire nails, small bottles, glass fragments, 22 caliber shell casings, bottle caps, and bone fragments are among the few objects found. All of the identifiable items recovered post-date the A.D. 1900 period and were found throughout the site area at various depths. None of those materials are culturally significant or important to the local prehistory of the region.

Identifiable historic materials:

Sample size = 27 Figure 24a-e.

Provenience:

Area VI	= X-2, L-2	Area VIII	= X-109, L-2
	X-3, L-1		X-130, L-1
	X-11, L-2		X-191, L-4
	X-15, L-2		X-225, L-3
			X-240, L-2
Area X	= X-3000, L-1		

Items:

22 cal. brass shell casing	= 4 (14.82%)
Unknown cal. brass shell casing	= 1 (3.70%)
Marbles	= 2 (7.41%)
Round wire nails	= 12 (44.44%)
Penny	= 1 (3.70%)
Iron fragments	= 6 (22.22%)
Small bottle	= 1 (3.70%)

Bottle Measurements (cm):

Max. Length	= 6.74
Max. Width	= 4.16
Min. Width	= 3.61
Max. Thickness	= 2.33
Min. Thickness	= 2.02

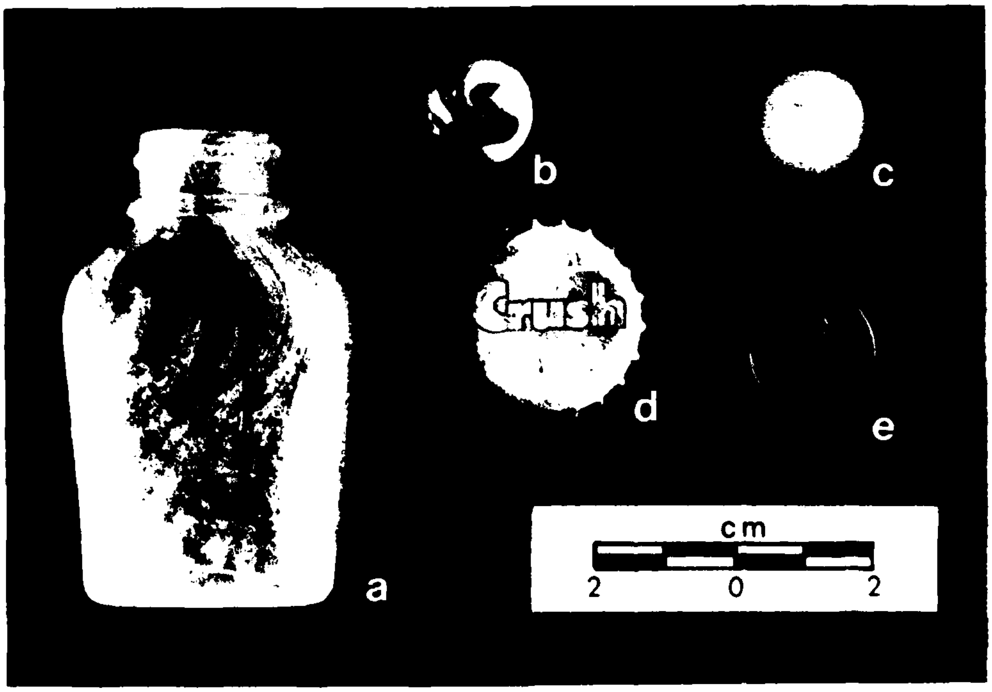

Figure 24. Historic artifacts: a) small bottle; b and c) marbles; d) crown bottle cap; e) U.S. penny.

PREHISTORIC ARTIFACTS

The prehistoric artifacts for the convenience of description can be grouped into four basic categories: a chipped stone or flaked stone category, a ground stone category, a bone and shell category, and a ceramic (pottery) category. The flaked stone objects are those which have been purposefully fractured by the hand of man or by fire used by man; the ground stone artifacts are those which have been polished and ground on abrading stones for use as hand stones or other artifacts; the bone and shell materials are those which have been modified into artifacts or utilized in the process of resource exploitation; and the ceramic category contains those objects of clay molded and fired to produce clay vessels and other objects utilized to perform specific tasks.

Flaked Stone Materials

The flaked stone artifacts and flake debitage recovered from the site consist of a number of chipped stone objects: flake debitage (waste flakes), edge damaged flakes, retouched flakes, biface fragments, biface blanks, projectile points, scrapers, exhausted cores and chunks, flake cores, blades, blade cores (?), core tablets, and what appears to be a punch made from a flake. Most of the objects in the chipped stone category were made of obsidian which could have been obtained from a number of nearby sources. Basalt, jasper, felsite, quartzite, opal, chalcedony, and a whole series of chert materials, however, were also used by the inhabitants of the site. All of the chipped stone objects made of these materials, with the exception of basalt, appear to have been transported into the area from an outside source as none occur in the immediate vicinity of the Hagerman site.

Flake Debitage (*waste flakes*)

During the 1980-81 investigation of the site a total of 359 waste flakes and chips were collected from three archaeological areas. Some 116 flakes were collected from Area VI, 130 flakes from Area VII, and 113 flakes werefound in Area VIII. The flakes found in Areas VI and VIII have been included in this discussion as these two areas were investigated during the subsequent Phase III testing of the site and because these data were required in order to map the distribution of the additional cultural materials obtained from these locations. [These maps do not appear in this report due to difficulties with them in reduction and reproduction processes.] Of the total of 3771 flakes recovered from the site during the two field seasons, 3641 have been included in this study. Most of these have well-developed striking platforms and bulbs of percussion, suggesting that they had been removed from a larger tool or core. Others appear to be chips representing shatter or broken flakes produced by free-hand percussion [cf. Table 10; Appendix A, Table 20]. All of the flake material, however, has been grouped under the general term "flake debitage" as it is apparently the by-product of tool manufacture. Edge damaged flakes, utilized flakes, and retouched flakes have been described under other categories and do not appear in the discussion presented below.

Most of the flakes and chips obtained from the areas tested were relatively small percussion and pressure flakes of 25 mm size or smaller. A total of 3437 (94.62%) flakes were smaller than the 25 mm size; and only 8 (0.22%) of the flakes were as large or larger than the 50 mm size. A comparison of the flake size frequencies [Table 10; Appendix A, Table 20] indicates that the greatest numbers of flakes found were of the 10, 15, and

20 mm sizes with frequencies of 1344 (37%), 1177 (32.41%), and 574 (15.30%), respectively.

These frequencies could suggest that no fine or very little fine percussion and pressure flaking was done at the site. The flakes that have been recovered consist predominantly of bifacial thinning and core reduction flakes of the kind assigned to Stage Two and Stage Three of Flenniken's Stone Tool Production Sequence. This inference should be viewed with considerable caution as all of the soil matrix removed from the excavation units was put through a 1/4-inch mesh screen and flakes smaller than 10 mm could have escaped the investigators, passing through the screen unseen. Flenniken, of Washington State University, has suggested that a large portion of the flakes found at any archaeological site consists of shatter produced by free-hand percussion flaking. Many of these flakes are very small and could, along with the fine, small pressure flakes, have been lost through the 1/4-inch screen. Flenniken (1978) has shown experimentally that flakes of this size can make up as much as 60% to 80% of the total number of flakes present at any site. Fine screening of the soil matrix with 1/8- to 1/16-inch mesh screen might be helpful in determining if fine pressure flaking was undertaken at the locale or in evaluating the amount of shatter present in the deposits. Flenniken (1978:72) has shown that the amount of shatter flakes, primary and secondary decortication flakes, thinning flakes, etc., are reflective of the level of lithic technology present at a site. Such studies are impractical at a testing level of analysis and go beyond the scope of work as outlined by the U.S. Army Corps of Engineers Archaeological Coordinator. Fortunately, a significant portion of the site remains intact where such detailed studies of this kind could be carried out and

where an extensive spatial analysis of the distribution of various flake types could be examined. (Note: Flenniken used almost exclusively obsidian from the Glass Buttes area of Oregon when conducting the shatter and debitage experiments. Since the vast majority of the flakes collected at the Hagerman site were of obsidian we would suggest that the Flenniken data would be very appropriate for the Hagerman site.)

When the debitage frequencies are examined in terms of the types of stone used by the tool makers, it is clear that certain lithic materials were preferred over other materials. As noted above, obsidian was by far the most preferred material used by the inhabitants of the site. Obsidian flakes account for 60.22% (2187) of the flakes recovered with lesser amounts of basalt (374; 10.30%), grey chert (225; 6.20%), white chert (222; 6.11%), jasper (177; 4.87%), red chert (153: 4.21%), brown chert (134; 3.69%), buff chert (49; 1.35%), pink chert (41; 1.13%), chalcedony (37; 1.02%), green chert (22; 0.61%), opal (10; 0.27%), and quartzite (1; 0.03%). These materials [Table 11; Appendix A, Table 21], along with some other igneous rocks used for the production of ground stone tools, constitute the basic raw materials used by the tool makers.

Size frequencies and lithic material frequencies have not been compared at the site for two very important reasons: 1) Less than 6% of the flakes are larger than the 25 mm size and fewer than 2.4% of the flakes are of the 5 mm size or smaller--a very narrow "window" of comparison, and 2) Lothson and Virga (1981:88) undertook a comparison of this kind during the earlier investigations of the site with largely negative results. As Lothson and Virga (1981:78) note:

> When the size frequencies with material preferred frequencies are compared, no real differences in material utilization is found. It is not found, for example, that large flakes were made almost exclusively of basalt and small flakes were of obsidian. The idea that obsidian was used primarily for small projectile points, knives, scrapers, and drills, and basalt and other volcanics for choppers, as is the case in the Columbia Basin, does not appear to hold up very well . . . . Even when a ranking system is applied in which the data is ranked both by increasing numerical frequency of size and by material, no meaningful difference can be seen in the materials utilized.

It would appear from the size data generated from the debitage analysis that a significant number of flake stone tools were produced at the site and that refitting, retouching, and replacing of broken stone tools on arrow and lance shafts were the major activities undertaken. This inference is based largely upon the size determinations as opposed to a detailed analysis of the technological systems used to produce the flakes.

Edge Damaged and Utilized Flakes

A relatively small number (19) of what we have defined as edge damaged and utilized flakes have been collected at the site. These flakes have one or more edges damaged either by trampling or by utilization as a cutting tool and have subsequently been discarded at the site. Most of these edge damaged and utilized flakes were of obsidian with a few examples of basalt and chert. The largest of the examples has a maximum length of 5.82 cm, and the smallest a minimum length of 1.48 cm. The mean length of the flakes is 2.57 cm, mean width is of the order of 1.76 cm, and the mean thickness of the flakes was 0.49 cm. All of the examples described here were collected by the 1981 field crew and 3 (15.79%) were collected from Area V; 6 (31.58%) from Area VI; 5 (26.32%) from Area VIII; and 5 (26.32%) from Area IX.

Sample size = 19	Figure 25a-b.
Provenience:	
Area V = X-1046, L-5 (2)	Area VI = X-407, L-4 (2)
X-1050, L-2	X-406, L-3
	X-456, L-3
Area VIII = X-335, L-6	X-664, L-2
X-226, L-4	X-420, L-4
X-239, L-5	
X-182, L-8	Area IX = X-2012, L-5 (2)
X-226, L-7	X-2010, L-5
	X-2009, L-4
	X-2006, L-5
Range in variation (cm):	Length = 1.48-5.82 Width = 0.95-3.72 Thickness = 0.21-0.82
Mean (cm):	Length = 2.57 Width = 1.75 Thickness = 0.25
Standard deviation (cm):	Length = 1.04 Width = 0.66 Thickness = 0.25
Shape:	Variable
Cross section:	Flat to convex, variable
Edges:	Straight to variable convex
Color:	Variable; black, N 2.5; dusky red, 10R 3/3; reddish-brown, 5YR 5/3, red 10R 4/6; gray, 5YR 8/1
Material:	Obsidian = 10 (52.63%) Chert = 5 (26.31%) Basalt = 3 (15.79%) Jasper = 1 (5.26%)
Luster:	Vitreous to dull or waxy
Method of manufacture:	Edge-damaged through use with small step fractures on one or more edges.

<u>Retouched Flakes</u>

The retouched flakes differ from the edge damaged and utilized flakes in two ways: 1) All flakes in this category have one or more purposefully retouched edges; and 2) Often this retouching is patterned along one or more edges and one or more faces rather than randomly present along an edge as they are on edge damaged and otherwise utilized flakes. A total of 18

Figure 25. Edge-damaged (a-b) and retouched (c-d) flakes and biface [illegible] (e-i): a) basalt, X-[illegible], Level 3; b) obsidian, X-[illegible], Level 2; c) X-2007, Level 3; d) X-441, Level 2; e) X-[illegible], Level [illegible]; f) X-1016, Level 2; g) X-1053, Level 2; h) X-[illegible], Level 3; i) preform fragment, X-2007, Level [illegible].

examples have been assigned to this group, 10 (55.56%) of which were obsidian, with lesser amounts of chert (6; 33.33%) and basalt (2; 11.11%). The largest of the flakes has a maximum length of 6.15 cm, and the smallest has a minimum length of 1.92 cm. The mean length of these flakes is 3.00 cm, mean width is 2.04 cm, and the mean thickness was 0.52 cm. All of the examples in this collection were obtained during the 1981 field season with 2 (11.11%) examples collected from Area V, 2 (11.11%) from Area VI, 5 (27.78%) from Area VIII, and 9 (50.00%) from Area IX.

Sample size = 18

Figure 25c-d.

Provenience:

Area V = X-1052, L-4 (2)

Area VIII = X-190, L-10
X-182, L-7
X-106, L-3
X-191, L-9 (2)

Area VI = X-468, L-5
X-441, L-2

Area IX = X-2007, L-3 (2)
X-2007, L-4
X-2007, L-5
X-2005, L-7 (2)
X-2013, L-3
X-2008, L-6
X-2001, L-6

Range in variation (cm):	Length = 1.92-6.15 Width = 0.98-4.11 Thickness = 0.21-0.78
Mean (cm):	Length = 3.00 Width = 2.04 Thickness = 0.52
Standard deviation (cm):	Length = 1.01 Width = 0.77 Thickness = 0.18
Shape:	Variable
Cross section:	Flat to convex, variable
Edges:	Straight to convex, variable
Color:	Variable; black, N 2.5 to 10YR 2/1; white, 5YR 7/1; reddish brown, 2.5YR 2.5/4; dark red, 10R 3/6; light gray 10YR 2.5/2.

Material:	Obsidian = 10 (55.56%)
	Chert = 6 (33.33%)
	Basalt = 2 (11.11%)
Luster:	Vitreous to dull and waxy
Method of manufacture:	Retouching in a patterned way along one or more edges.

Biface Fragments

A number of biface fragments, 39 examples, were obtained from the excavation units at the Hagerman site. Some of the examples have been percussion flaked only, while others have one or more edges finely retouched. All of the examples, however, have been worked on both faces, and all of the examples were broken either in the act of manufacture or subsequent to manufacture and use. None of the examples have been measured, but all have been identified as to location, material, and color of material. Most of the fragments, for example, were collected from Areas V, VI, and IX, with 10 (25.64%) fragments from Area V, 11 (28.21%) from Area VI, 2 (5.13%) from Area VIII, 13 (33.33%) from Area IX, and 1 (2.56%) fragment from Area X. A total of 29 (74.36%) examples were made from one of the many cherts that were utilized. Two of the fragments in the above tabulations were collected by Lothson and Virga (1981) and the remaining 37 were collected by the authors of this study [i.e., Lothson, Linse, and Virga].

Sample size = 39 Figure 25e-i.

Provenience:

Area V	= X-1035, L-3	Area VI	= X-406, L-3
	X-1052, L-4		X-407, L-4 (2)
	X-1053, L-2		X-457, L-2
	X-1053, L-3		X-440, L-2 (2)
	X-1034, L-4		X-503, L-4
	X-1009, L-2		X-419, L-3
	X-1027, L-3		X-2, L-2
	X-1016, L-2		X-441, L-2
	X-1040, L-4		X-500, L-1
	X-1057, L-5		

Provenience (cont.):

Area VII	= X-10, L-3 (2)	Area VIII	= X-130, L-5
			X-106, L-2
Area IX	= X-2010, L-6		
	X-2004, L-5	Area X	= X-3012, L-1
	X-2009, L-4 (2)		
	X-2009, L-5		
	X-2009, L-6		
	X-2006, L-1		
	X-2006, L-3		
	X-2006, L-8		
	X-2005, L-5 (2)		
	X-2007, L-4 (2)		

Range in variation (cm):	Length = NA Width = NA Thickness = NA
Shape:	Variable
Cross section:	Double-convex
Edges:	Straight to slightly convex
Color:	Black, N 2.5; white, 2.5YR 8/2; dark gray, N 3; weak red, 10R 3/3; strong brown, 7.5YR 5/6
Material:	Obsidian = 29 (75.35%) Chert = 7 (17.95%) Jasper = 2 (5.13%) Basalt = 1 (2.56%)
Luster:	Vitreous to dull and waxy
Method of manufacture:	Percussion flaking on two faces with fine retouching on some examples. Some examples exhibit perverse fracture, suggesting breakage in the process of manufacture.

Biface Blanks

Only four biface blanks, projectile point preforms, percussion flaked on two faces, were collected at the site. These roughed-out preforms are ovate, triangular to leaf-shaped in form, and were made from flakes struck from large cores or produced by core-biface reduction. One of the blanks was obtained from Area V, one other from Area VI, and the remaining two from Area IX. Three of the four examples were made from obsidian flakes; the other appears to have been produced by core-biface reduction from a

quartzite nodule. All of the examples collected from the site were recovered during the Phase III testing of the locality by the authors of this study [i.e., Lothson, Linse, and Virga].

Sample size = 4	Figure 26a-d.
Provenience:	
Area V = X-1045, L-6	Area VI = X-407, L-3
Area IX = X-2009, L-7 X-2007, L-5	
Range in variation (cm):	Length = 2.25-6.78 Width = 1.38-4.46 Thickness = 0.43-2.43 Width at base = 1.63-3.43
Mean (cm):	Length = 3.67 Width = 2.57 Thickness = 1.00 Width at base = 2.36
Standard deviation (cm):	Length = 2.14 Width = 1.32 Thickness = 0.95 Width at base = 0.76
Shape:	Ovate, triangular, pointed, and leaf-shaped
Cross section:	Double-convex, to convex-flat
Edges:	Straight to convex
Color:	Variable; black, N 2.5; pale red 10R 6/3
Material:	Obsidian = 3 (75.00%) Quartzite = 1 (25.00%)
Luster:	Vitreous to dull
Method of manufacture:	Percussion flaking on both faces with no fine retouching on any of the edges. Bifaces made largely from flakes with one core-reduction quartzite type present.

Projectile Points

Although the large biface blanks are non-diagnostic of any prehistoric period, the smaller projectile points do give a general date of occupation of the site. According to B. Robert Butler (1978:Figure 37), the greater

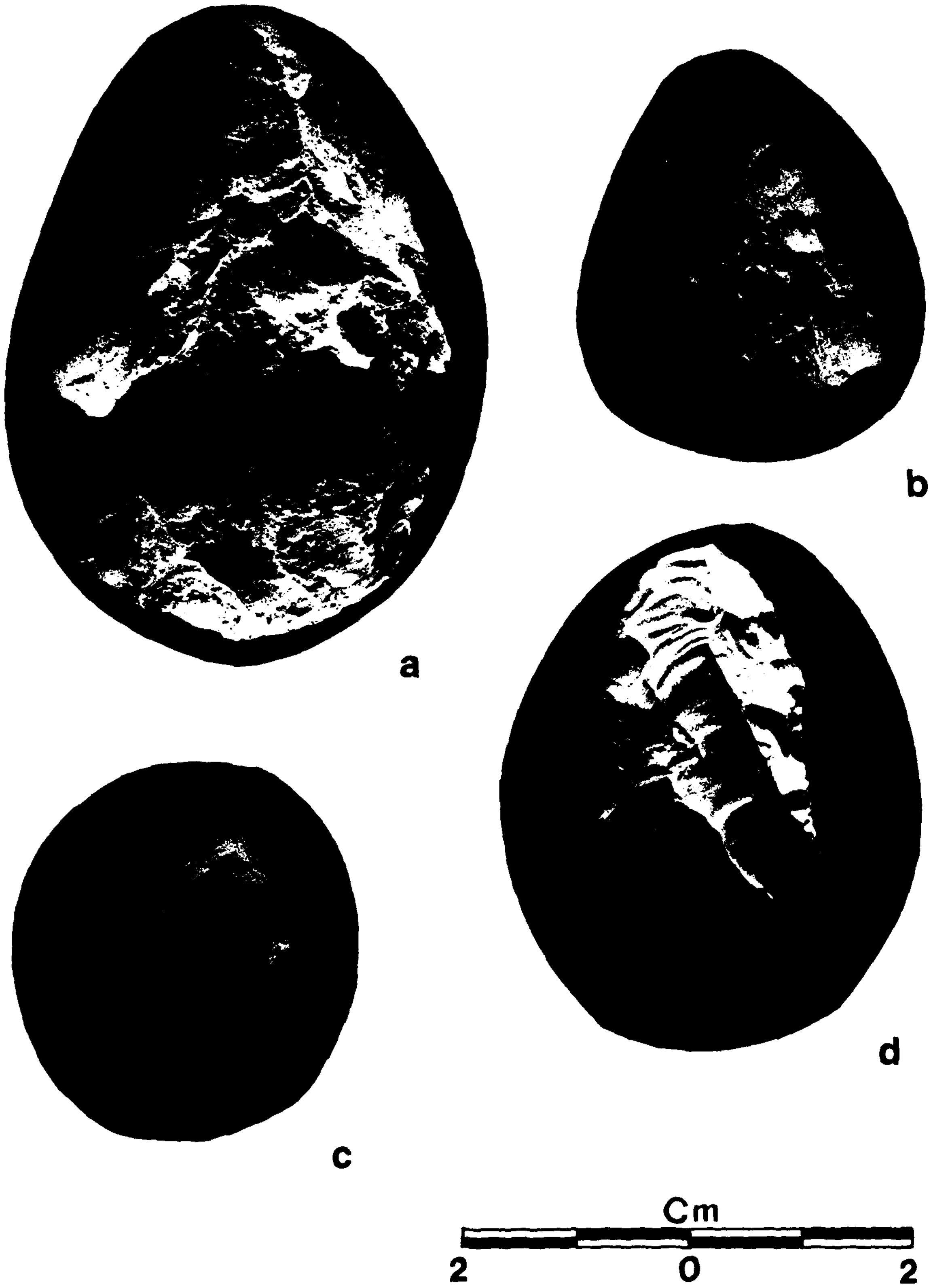

Figure 26. Biface and projectile point blanks: a) quartzite, X-2007, Level 5; b) obsidian, X-2009, Level F; c) X-407, Level 3; d) preform, X-1045, Level 6.

number of these small projectile points date to the late prehistoric period and are dominated by the "Bitterroot side-notched" and "Desert side-notched" types--types generally asasociated with Great Basin archaeological assemblages. One other basic kind of projectile point type, actually a series of projectile point types, the corner-notched and eared types, are also present in some numbers at the Hagerman site. All of these types, according to Butler (1978), Holley (1977) and Baxter (1981), have a wide distribution throughout the Snake River Plain and adjacent regions, and all agree that the points date to the Late Prehistoric Period.

Pavesic and Meatte (1980:123) have described six different projectile point types at the site: Rose Springs corner-notched, Bliss, Elko side-notched, Eastgate expanding stem, Elko eared, and Elko corner-notched. During the earlier investigation of the site by Lothson and Virga (1981:79), only four projectile points and three large biface fragments were found. All of these points could be assigned to one of Pavesic and Meatte's projectile point categories. The points recovered from the Hagerman site during the following field season, however, included 61 complete and partial points not all of which could be assigned to the types described by Pavesic and Meatte (1980:123). In addition, many of the points found exhibit some variability in both size and shape suggesting a range of variation within the basic types as described by Butler (1978), Fagan (1974), Swanson (1972), etc.

For the purposes of description we have retained the general point types and descriptions commonly used in the literature and have called these variants subtypes I, II, etc. of the larger corner-notched and side-notched types, recognizing full well that these differences are largely a reflection

of slight differences in technology, reuse, and reflaking of broken points. As Flenniken states (1978:87):

> Breakages did occur at this stage of manufacture, at either the tip or base, or both. When a finished tip was broken off, a new tip was simply reflaked in the appropriate location on the distal end of the point. Occasionally, an "ear", the mass between the notch and the base, would break off and as a result of reflaking the base, the arrow point would change morphologically. In other words, reflaking basal areas resulting in changing the arrow point from one morphological "type" to another morphological "type". Nonetheless, the arrow point was still quite functional and was not discarded. Upon completion of the flaking of the lateral margins and tip, the arrow was finished and ready for hafting.

In addition, we have appended a question mark (?) to several of the point types we have described as we are uncertain as to their typological classification. Many of these projectile point types are variations of the side-notched, corner-notched, or basal-notched projectile point traditions in the region, and as such, they may reflect variations of the kind described above by Flenniken (1978:87), or differences in function as opposed to temporal and cultural differences. We have grouped them and assigned them to the various known projectile point types purely on the basis of singular morphological characteristics as described in the literature.

There appear to be at least 11 projectile point types and one catch-all category of broken and unrecognizable points present at the Hagerman site. These include: Elko corner-notched, Desert side-notched, Rose Springs corner-notched, a stemmed, indented-base type, Wallula rectangular-stemmed (?), Bliss type, Cottonwood (?), Elko side-notched, Bitterroot side-notched (?), Blue Dome points (?), Elko eared, and an unknown category of broken tips, bases, and midsections. The most significant, or at least one of the more interesting factors here is that nearly all of the points found have

been broken in some way, suggesting either that they were broken and discarded by the inhabitants, or were subsequently broken after deposition, perhaps during the initial construction of the Fish Hatchery facilities--perhaps both explanations are at work here. We, however, tend to favor the first explanation for reasons that will be explained later.

(I) Elko Corner-Notched Points. Projectile points assigned to this category (5 points) have a broad triangular to slightly leaf-shaped form, are corner-notched, and have straight to slightly convex edges. All of the examples exhibit fine pressure flaking on all edges, are often dulled and thinned at the base for hafting, and appear to have been made from flakes. Two subtypes have been recognized within the basic type. The first has well-developed corner-notches, the "ears" of which do not meet the basal plane [Figure 27a-c]. The other has the same basic triangular form but appears to have been modified and reshaped, probably the result of an attempt at reuse of a broken point [Figure 27d]. All of these points are relatively large in comparison to the other projectile points found at the locale.

Sample size = 5	Figure 27a-d. Heizer and Hester 1978
Provenience: Area V = X-1032, L-3 X-1046, L-4 X-1019, L-2 X-1041, L-3 X-1043, L-3	
Range in variation (cm):	Length = 3.01 (one example complete) Width = 2.18-2.77 Thickness = 0.44-0.54 Width at base = 1.11-1.78
Mean (cm):	Length = NA Width = 2.44 Thickness = 0.49 Width at base = 1.55

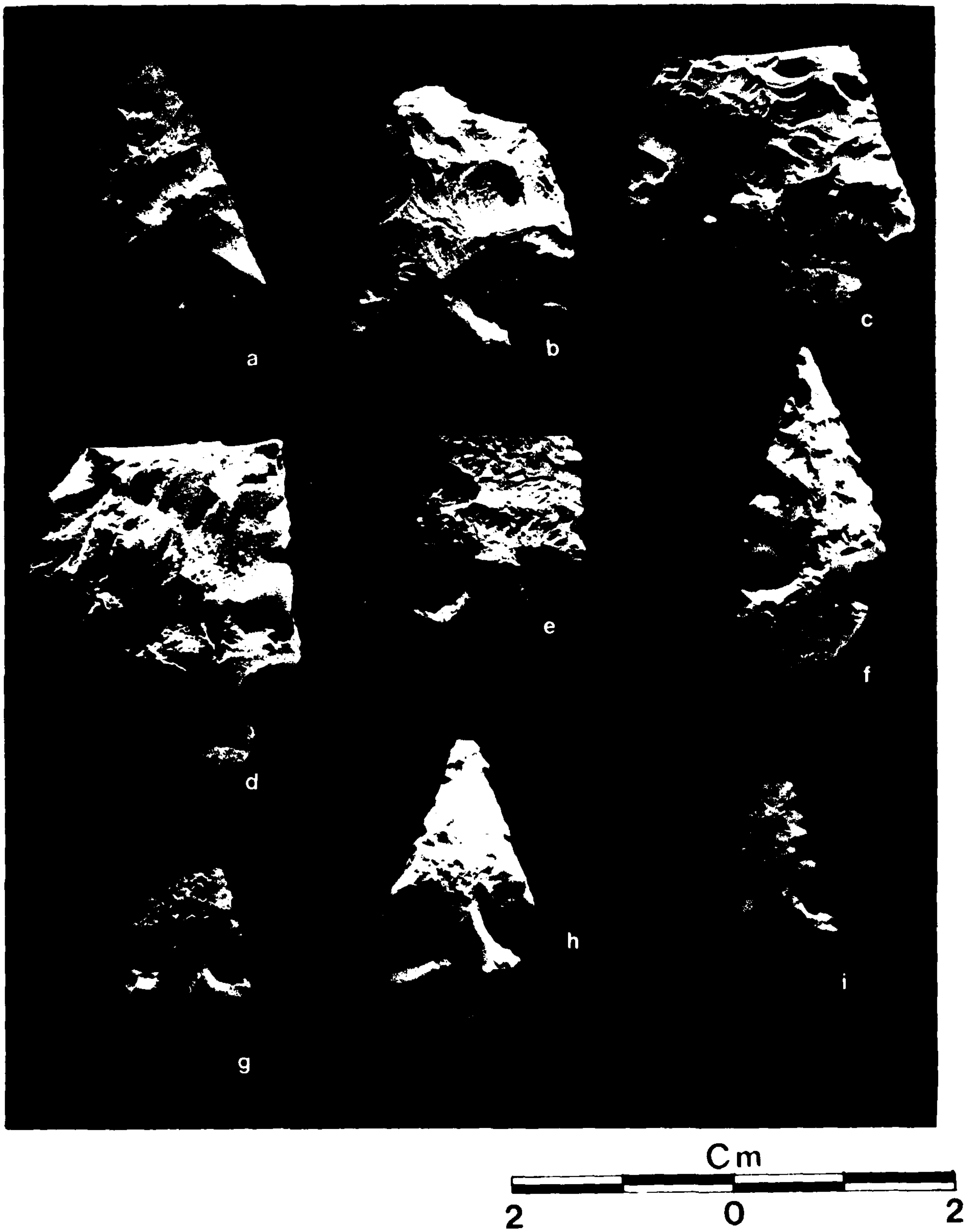

Figure 27. Elko corner-notched (a-d) and Desert side-notched (e-i) projectile points: a) X-1043, Level 3; b) X-1019, Level 2; c) X-[illegible], Level [illegible]; d) X-1046, Level 4; e) X-1042, Level 1; f) X-[illegible], Level [illegible]; g) X-649, Level [illegible]; h) X-3, Level 2; i) X-[illegible], Level [illegible].

Standard deviation (cm):	Length = NA Width = 0.27 Thickness = 0.04 Width at base = 0.31
Shape:	Triangular
Cross section:	Double-convex
Edges:	Straight to very slightly convex
Base:	Convex to straight
Color:	Variable; black, N 2.5; weak red, 10R 4/3; gray, N 3
Material:	Obsidian = 2 (60.00%) Red Chert = 1 (20.00%) Basalt = 1 (20.00%)
Luster:	Vitreous, dull to slightly waxy
Method of manufacture:	Projectile points made from flakes, fine retouching on all edges, corner-notching on all examples, thinned at the base and some basal grinding on the edges, dulled at the base.

(II) Desert Side-Notched Points. A total of 10 side-notched projectile points have been assigned to this category. All of these points have straight to convex edges, are triangular in form, and some have basal notching present. Some of the examples found have convex bases or very slightly convex bases, and the whole category is characterized by variability. Modification of the type discussed earlier by Flenniken also is present in this category. Projectile points of this type are usually very small and were probably used to tip arrow shafts (Butler 1978:Figures 25, 35, and 37). Points of this kind are characteristic of the Great Basin and are widespread throughout the Snake River Plain. Their presence at the Hagerman National Fish Hatchery site was expected.

Sample size = 10

Figure 27e-i.
Hester 1973; Butler 1978, 1981

Provenience:

Area V = X-1052, L-4
X-1042, L-2
X-1042, L-1

Area VI = X-649, L-5
X-3, L-2

Provenience (cont.):	
Area VIII = X-105, L-4	Area IX = X-2000, L-8 X-2007, L-2 x-2009, L-2
Area X = X-3016, L-2	
Range in variation (cm):	Length = 1.77-3.01 Width = 1.24-1.86 Thickness = 0.16-0.54 Width at base = 1.24-1.86
Mean (cm):	Length = 2.55 Width = 1.54 Thickness = 1.35 Width at base = 1.52
Standard deviation (cm):	Length = 0.68 Width = 0.25 Thickness = 0.13 Width at base = 0.23
Shape:	Triangular to slightly leaf-shaped
Cross section:	Double-convex
Edges:	Straight to convex
Color:	Variable; black, N 2.5; weak red, 10R 4/4
Material:	Obsidian = 9 (90.00%) Red Chert = 1 (10.00%)
Luster:	Vitreous to dull waxy
Method of manufacture:	Projectile points made from flakes, fine retouching on all edges, side-notched on all examples, thinned at the base, some basal grinding present, straight edges with a few examples slightly convex. Some examples have been notched at the base.

(III) Rose Springs Corner-Notched Points. These corner-notched points (15) are similar in shape to the Elko corner-notched except that they are very small in size. The points are triangular in form, slightly leaf-shaped, are corner-notched, and have straight to slightly convex edges. All of the points apparently were made from flakes, and a few of the examples are convex-flat in cross section. Three subtypes have been recognized within the basic type, the difference of which is largely one of basal form

that varies from convex to concave. Subtype III-I has well-developed corner-notches that do not extend to the basal plane and a straight to very slightly convex base [Figure 28a-f]. Subtype III-II also has well-developed corner-notches but has a definite convex base [Figure 28g]. Subtype III-III has poorly developed corner-notching and variable convex to straight base and probably represents reworked forms [Figure 28h-j].

Sample size = 15	Figure 28a-j. Heizer and Hester 1978
Provenience: Area V = X-1029, L-2 X-1053, L-2 X-1053, L-5 X-1057, L-5 X-1052, L-5 X-1050, L-4 X-1014, L-2 X-1051, L-2 X-1057, L-4	Area VI = X-492, L-3 X-406, L-3 X-420, L-2 X-406, L-3 Area VIII = X-130, L-4 Area IX = X-2006, L-2
Range in variation (cm):	Length = 1.82-4.44 Width = 1.05-2.18 Thickness = 0.18-0.58 Width at base = 0.52-1.71
Mean (cm):	Length = 2.81 Width = 1.69 Thickness = 0.40 Width at base = 0.95
Standard deviation (cm):	Length = 1.08 Width = 0.34 Thickness = 0.13 Width at base = 0.41
Shape:	Triangular to slightly leaf-shaped
Cross section:	Double-convex
Edges:	Convex to straight
Base:	Concave to convex often straight
Color:	Black, N 2.5
Material:	Obsidian = 15 (100.00%)
Luster:	Vitreous to opaque dull
Method of manufacture:	Projectile points made from flakes, fine pressure flaking on all edges, corner-notched on all examples, thinned at the base and some basal grinding present, dulled at the base.

Figure 28. Rose Springs corner-notched projectile points: a) X-1053, Level 5; b) X-1052, Level 5; c) X-1053, Level 2; d) X-492, Level 3; e) X-1057, Level 5; f) X-1029, Level 2; g) X-2006, Level 2; h) X-130, Level 4; i) X-1057, Level 4; j) X-1014, Level 2.

(IV) Stemmed Indented-Base Points. Only one stemmed point with an indented base was obtained from the Hagerman site. This projectile point type, according to Butler (1978:Figure 37), has a long temporal span in the upper Snake and Salmon River region and first appears during the Early Archaic, ca. 7000 B.P. The point type also is found in late prehistoric contexts (Butler 1978), and its presence at the Hagerman location was not totally unexpected. Points of this type are characterized by the presence of a definite stem that is indented, an apparent shoulder, and a general leaf to triangular shape. The points are double-convex in cross section, finely pressure flaked on all edges, purposefully dulled on the lower stem and base, and have convex edges [Figure 29a].

Sample size = 1	Figure 29a. Heizer and Hester 1978; Holley 1977
Provenience: Area IX = X-2013, L-2	
Range in variation (cm):	Length = NA Width = 2.33 Thickness = 0.62 Width at base = 1.28
Mean (cm):	Length = NA Width = 2.33 Thickness = 0.62 Width at base = 1.28
Standard deviation (cm):	Length = NA Width = NA Thickness = NA Width at base = NA
Shape:	Leaf-shaped
Cross section:	Double-convex
Edges:	Convex to straight
Base:	Concave-indented
Color:	Black, N 2.5
Material:	Obsidian = 1 (100.00%)
Luster:	Vitreous

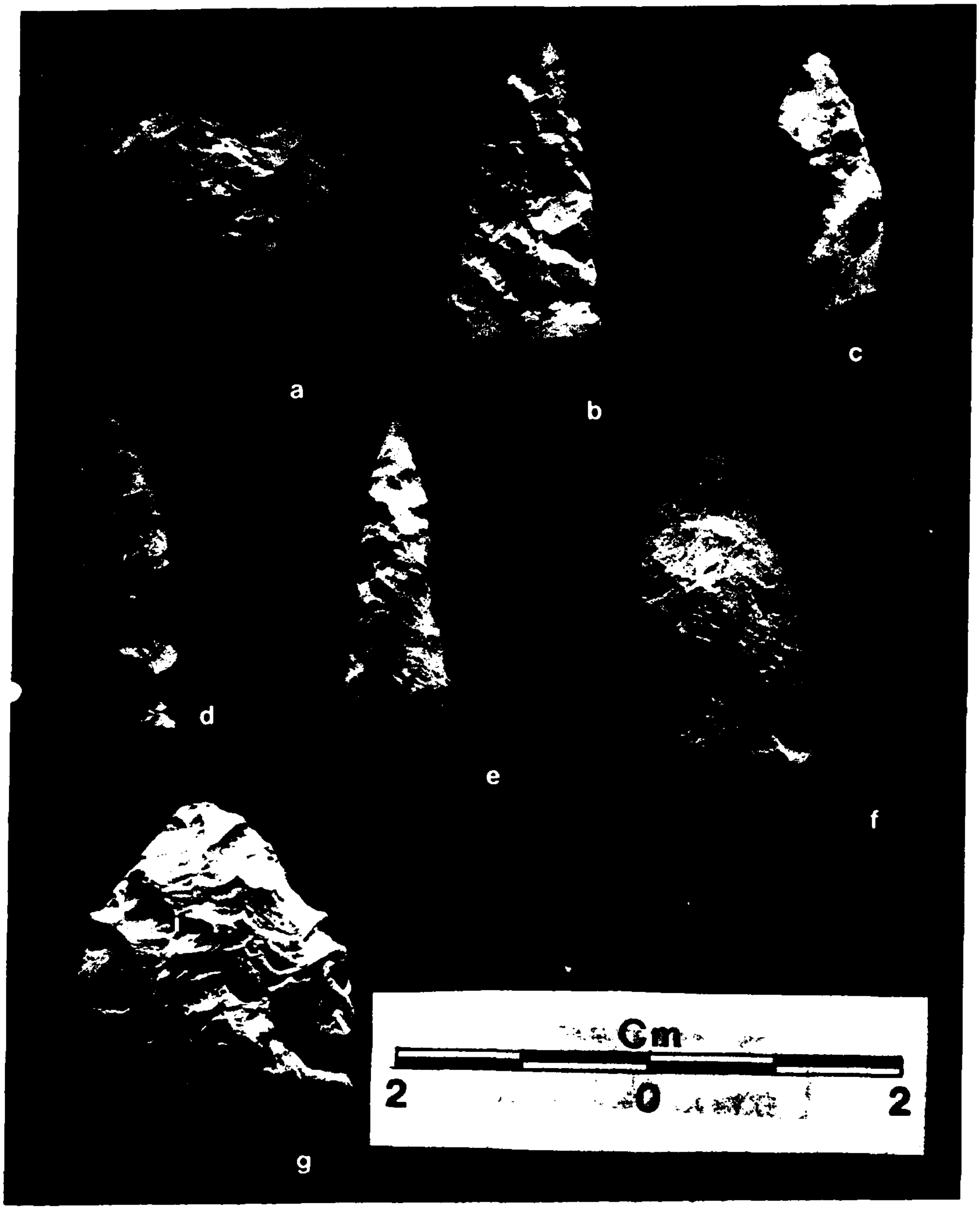

Figure 29. Additional projectile points from the Hagerman site: a) stemmed, indented-base, X-2013, Level 2; b) Wallula rectangular-stemmed, X-1057, Level 5; c) Bliss, X-10[illegible]2, Level 2; d) Bliss, X-1045, Level 5; e) Cottonwood, X-10[illegible], Level 5; f) Bitterroot side-notched (?), X-1[illegible], Level 5; g) Blue Dome side-notched (?), X-2005, Level 7.

Method of manufacture: Projectile points are all on flakes, fine pressure flaking on all edges, basal-notched, stemmed type, shoulder present and slightly rounded, purposeful indenting of the base probably for hafting, and dulling and grinding applied to the stem.

(V) Wallula Rectangular Stemmed Points (?). Only two projectile points of the Wallula rectangular stemmed type have been recovered from the Hagerman site. There is some disagreement as to the form and shape of these points (Leonhardy and Rice 1970), and over what has been called Wallula rectangular by other authors (Baxter 1981; Nelson 1969). Both points could just as easily be assigned to one of the corner-notched types as they could represent reworked and modified points broken during manufacture. We have tentatively, therefore, assigned these points to this morphological classification on the basis of their similarity to those recovered by Toepel (Baxter 1981:193) and to those described by Leonhardy and Rice (1970) and Lothson and Lindeman (1981:103). These points are long isosceles triangular in form, rectangular stemmed, thinned at the base, finely pressure flaked on all edges, and dulled and ground at the base for hafting [Figure 29b].

Sample size = 2

Figure 29b.
Leonhardy and Rice 1970

Provenience:
Area V = X-1057, L-5
X-1052, L-6

Range in variation (cm):
Length = NA
Width = 1.26 (one example)
Thickness = 0.32 (one example)
Width at base = 0.62-1.62

Mean (cm):
Length = NA
Width = 1.26 (one example)
Thickness = 0.32 (one example)
Width at base = 1.11

Standard deviation (cm):	Length = NA Width = NA Thickness = NA Width at base = NA
Shape:	Triangular to leaf-shaped
Cross section:	Double-convex
Edges:	Straight
Base:	Straight to very slightly concave
Color:	Black, N 2.5
Material:	Obsidian = 2 (100.00%)
Luster:	Vitreous to dull
Method of manufacture:	Projectile points made from small preforms made from flakes, stemmed, thinned at the base, some basal grinding, dulled at the base, fine pressure flaking on all edges.

(VI) Bliss Projectile Points. Two fragmentary projectile points with small lanceolate blades, convex edges, double-convex in cross section with a slight shoulder were recovered from the Hagerman National Fish Hatchery site [Figure 29c-d]. These points are finely pressure flaked and appear to have been made from small flakes. Unfortunately, both of these points were broken at the side and base, and their tentative assignment to the Bliss type has been based purely upon morphological similarities with points of this type described by Pavesic and Meatte (1980:54).

Sample size = 2	Figure 29c-d. Pavesic and Meatte 1980
Provenience: Area V = X-1042, L-2 X-1054, L-5	
Range in variation (cm):	Length = NA Width = 0.78-1.01 Thickness = 0.42-0.48 Width at base = NA
Mean (cm):	Length = NA Width = 0.90 Thickness = 0.45 Width at base = NA

Standard deviation (cm):	Length = NA Width = NA Thickness = NA Width at base = NA
Shape:	Lanceolate to rectangular straight
Cross section:	Double-convex
Edges:	Straight to convex
Base:	Unknown, NA
Color:	White, 2.5Y 8/2 to 5YR 8/2
Material:	Chert = 2 (100.00%)
Luster:	Waxy
Method of manufacture:	Very fine parallel flaking on one example, poor random flaking on the other example, straight to slightly curved forms.

(VII) Cottonwood Projectile Points (?). One small narrow pick-like projectile point that we have tentatively assigned to the Cottonwood projectile point class was found at the Hagerman site. This point (?) exhibits none of the fine pressure flaking seen on other examples from the site. The point was thinned at the base, basally ground for hafting, very slightly notched at the base, and is isosceles triangular in form.

Sample size = 1	Figure 29e. Swanson 1972
Provenience: Area V = X-1053, L-5	
Range in variation (cm):	Length = 2.84 Width = 0.96 Thickness = 0.31 Width at base = 0.73
Mean (cm):	Length = 2.84 Width = 0.96 Thickness = 0.31 Width at base = 0.73
Standard deviation (cm):	Length = NA Width = NA Thickness = NA Width at base = NA
Shape:	Long isosceles triangular
Cross section:	Double-convex

Edges:	Concave
Base:	Straight
Color:	Dusky red, 10R 3/4
Material:	Chert = 1 (100.00%)
Luster:	Waxy
Method of manufacture:	No fine pressure flaking present on any of the edges, basal grinding on and at the base, thinned at the base, very slightly corner-notched.

(VIII) Elko Side-Notched Points. One side-notched projectile point with a leaf-shaped form, convex edges, straight to slightly convex base, and fine pressure flaking applied to the edges was obtained from the Hagerman locality. This point was assigned to the Elko side-notched series, as it most closely resembles the Elko side-notched point recorded from the Hagerman site by Pavesic and Meatte (1980:123). This point could also, however, be assigned to the Desert side-notched category as the shape, form, and method of manufacture does not differ significantly from this point type. The major significant difference appears to be size rather than morphological characteristics. Most of the Desert side-notched points seldom exceed 1.5 cm at the base. The point found by Pavesic and Meatte (1980) is somewhat larger, and the point recovered by the present authors [Lothson, Linse, and Virga] exceeds 2.30 cm at the base.

Sample size = 1

Figure 29e.
Swanson 1972

Provenience:
Area VI = X-1, L-2

Range in variation (cm):
Length = NA
Width = NA
Thickness = 2.37
Width at base = 2.32

Mean (cm):
Length = NA
Width = NA
Thickness = 2.37
Width at base = 2.32

Standard deviation (cm):	Length = NA Width = NA Thickness = NA Width at base = NA
Shape:	Leaf-shaped (?)
Cross section:	Double-convex
Edges:	NA
Base:	Very slightly convex
Color:	Black, N 2.5
Material:	Obsidian = 1 (100.00%)
Luster:	Vitreous
Method of manufacture:	Side-notching, dulling at the base, thinned at the base, fine pressure flaking on all edges, and possible basal grinding. Slightly flatter portion of the point suggests that it was made from a flake.

(IX) Bitterroot Side-Notched Points (Blue Dome?). Only one projectile point tentatively assigned to this category has been recovered from the Hagerman site. Bitterroot side-notched points, like the indented base type discussed earlier, were utilized over a protracted period of time, appearing first during the latter part of the Early Archaic, ca. 5000 B.P. This point type continued to be used, according to Butler (1978), up through the Late Prehistoric, and its presence alongside later Desert side-notched and Rose Springs corner-notched types at the Hagerman locale is not inconsistent with the stratigraphic information collected from the region. Points of this type are usually leaf-shaped to triangular in form, double-convex in cross section, side-notched, finely retouched on both edges and at the base, and often exhibit large thinning flake scars at the base. In addition, the projectile points are rather large in comparison to the contemporary small Desert side-notched types, often exceeding the smaller points by 1 to 2 cm at the base. The projectile point collected from the Hagerman site, for example, measured 2.98 cm at the base [Figure 29f].

Sample size = 1	Figure 29f. Swanson 1972; Gruhn 1961a
Provenience: Area VIII = X-105, L-5	
Range in variation (cm):	Length = NA Width = NA Thickness = 0.58 Width at base = 2.98
Mean (cm):	Length = NA Width = NA Thickness = 0.58 Width at base = 2.98
Standard deviation (cm):	Length = NA Width = NA Thickness = NA Width at base = NA
Shape:	Leaf-shaped to triangular
Cross section:	Double-convex
Edges:	Convex
Base:	Straight to very slightly concave
Color:	Black, N 2.5
Material:	Obsidian = 1 (100.00%)
Luster:	Vitreous
Method of manufacture:	Fine pressure flaking on all edges, side-notches very shallow, thinned at the base for hafting, some evidence of basal grinding. The point appears to have been made from a flake.

(X) Blue Dome Side-Notched Projectile Points. One projectile point of the Blue Dome side-notched type was collected from one of the excavation units at the Hagerman site. This projectile point, according to Butler (1981:11-12), dates to the Late and Middle Prehistoric periods. Points of this kind have been found at Bison Rockshelter and Veratic Rockshelter (Swanson 1972), Bighorn Shelter (Ranere 1971), and at the nearby Wilson Butte Cave Site (Gruhn 1961a). The points are characterized by a broad, stout-appearing blade, side-notching, concave base, rounded tip, and thinning at the base. The particular specimen found at the Hagerman site

appeared to be an unfinished point, as it lacks the fine pressure flaking which appears on other examples (Butler 1981:25). It also appears to have some of the percussion platforms present which are usually removed during the fine pressure flaking phase of the manufacturing process [Figure 29g].

Sample size = 1	Figure 29g. Swanson 1972; Gruhn 1961a; Ranere 1971; Butler 1978, 1981
Provenience: Area IX = X-2005, L-7	
Range in variation (cm):	Length = 2.71 Width = 2.13 Thickness = 0.39 Width at base = 1.89
Mean (cm):	Length = 2.71 Width = 2.13 Thickness = 0.39 Width at base = 1.89
Standard deviation (cm):	Length = NA Width = NA Thickness = NA Width at base = NA
Shape:	Leaf-shaped
Cross section:	Double-convex
Edges:	Convex
Base:	Concave to slightly concave
Color:	Black, N 2.5
Material:	Obsidian = 1 (100.00%)
Luster:	Vitreous
Method of manufacture:	Percussion flaking, fine pressure flaking absent on any edge, side-notching deep, thinned at the base, dulling and basal grinding absent--incompletely finished point?

(XI) Elko Eared Projectile Point (?). A single broken projectile point of the Elko eared type was collected at the site. This point has been assigned to this category by the writers purely on the basis of its similarity with the point found and described by Pavesic and Meatte (1980:123). According to Pavesic and Meatte (1980:50), these points are triangular in

form, have straight to very slightly convex edges, a prominent concave base, are double-convex in cross section, and have deep diagonal notches and fine pressure flaking. The example collected at the Hagerman locale was so fragmentary that only a portion of the base and one side remained. These parts suggest basal thinning, basal grinding, deep corner notching of the kind described by Pavesic and Meatte (1980:50), and a triangular shape--all of the characteristics noted by Pavesic and Meatte for points of this type.

Sample size = 1	Heizer and Hester 1978
Provenience: Area VIII = X-130, L-3	
Range in variation (cm):	Length = NA Width = NA Thickness = 0.32 Width at Base = NA
Mean (cm):	Length = NA Width = NA Thickness = 0.32 Width at base = NA
Standard deviation (cm):	Length = NA Width = NA Thickness = NA Width at base = NA
Shape:	Triangular
Cross section:	Double-convex
Edges:	Straight to slightly concave
Base:	Straight to very slightly concave
Color:	Black, N 2.5
Material:	Obsidian = 1 (100.00%)
Luster:	Vitreous
Method of manufacture:	Fine retouching on all edges, deeply corner-notched, thinned at the base, dulled at the base, basal grinding present.

(XII) Projectile Point Fragments. A total of 21 additional unrecognizable projectile point fragments were collected from the Hagerman National Fish Hatchery site. These 21 fragments consist largely of tip and medial

sections, as the basal fragments are usually identifiable as to morphological type. Nine (42.85%) of the fragments consisted of tips only, 7 (33.33%) were of medial sections only, 2 (9.52%) were unrecognizable basal fragments, and 3 (14.28%) consisted of tips and partial medial sections. Some of the fragments appear to represent points broken during manufacture, as the fine pressure flaking usually seen on completed and utilized points is absent. A total of six (28.57%) of the fragments lack this fine pressure flaking, and three of these fragments were tips only, two were medial fragments, and one fragment was a basal element.

Sample size = 21 [But only 20 proveniences are given here.]

Provenience:

Area V	= X-1014, L-2 TO	Area VI	= X-492, L-3 TO
	X-1054, L-6 TO		X-1, L-5 MS
	X-1011, L-1 TO		
	X-1053, L-5 TO	Area VIII	= X-240, L-0 MS
	X-1051, L-2 TO		
	X-1044, L-4 TO	Area IX	= X-2009, L-4 MS
	X-1054, L-3 TO		X-2007, L-4 MS
	X-1046, L-3 MS		X-2009, L-3 MS
	X-1052, L-5 MS		X-2013, L-5 B
	X-1054, L-4 B		
	X-1040, L-4 (2) TMS	Area X	= X-3001, L-1 MS

(TO = tip only; MS = medial section only; B = basal section only; TMS = tip and mid-section)

Shape:	Triangular to leaf-shaped
Cross section:	Double-convex to convex-flat
Edges:	Straight to convex
Base:	Unknown
Color:	Variable; black, N 2.5 to N 3; dusky red, 10R 3/3; pinkish-grey, 7.5YR 6/2; very dark red, 10R 2.5/1
Material:	Obsidian = 15 (71.42%)
	Black chert = 3 (14.29%)
	Jasper = 1 (4.78%)
	Brown chert = 1 (4.78%)
	Pink chert = 1 (4.78%)
Luster:	Vitreous to dull waxy
Method of manufacture:	Fine pressure flaking and percussion flaking.

Scrapers

The flaked stone tools that have been assigned to this class are largely unifacially flaked objects that have been used to perform some scraping function. Bifacially flaked tools, however, have not been eliminated from this morphological class as some of the examples recovered from the site have been bifacially flaked on one or more edges. All of the examples, however, have the high-inclined, unifacially flaked, stout edge that is characteristic of scrapers. Three basic types or classes have been recognized by the writers of this study [Lothson, Linse, and Virga]: a group of small flake scrapers, a number of trapezoidal-shaped flake scrapers, and a group of large bifacial-unifacial flake scrapers. All of these objects appear to have been made from flakes struck from cores, and all have at least one or more unifacially produced high-angle edges.

(I) Small Flake Scrapers. A total of 12 small flake scrapers, flakes that have one or more unifacially flaked, modified edges, have been found at the Hagerman site. These flakes exhibit only slight alteration of the edges so as to produce the high chisel-like edge common to scrapers of this type. Most of the examples grouped in this category were made from small obsidian and chert flakes. Interestingly, chert flake scrapers outnumber the obsidian flake scrapers more than two to one. This is the only artifact class present at the Hagerman site where chert appears to have been the preferred material. We would suggest that this preference might be a function of the material itself--obsidian, although being somewhat sharper for cutting purposes, dulls quickly and breaks more easily under stress than does chert. Chert materials may not produce as sharp an edge as obsidian when struck from a core, but it may hold that edge longer [Figure 30a-c].

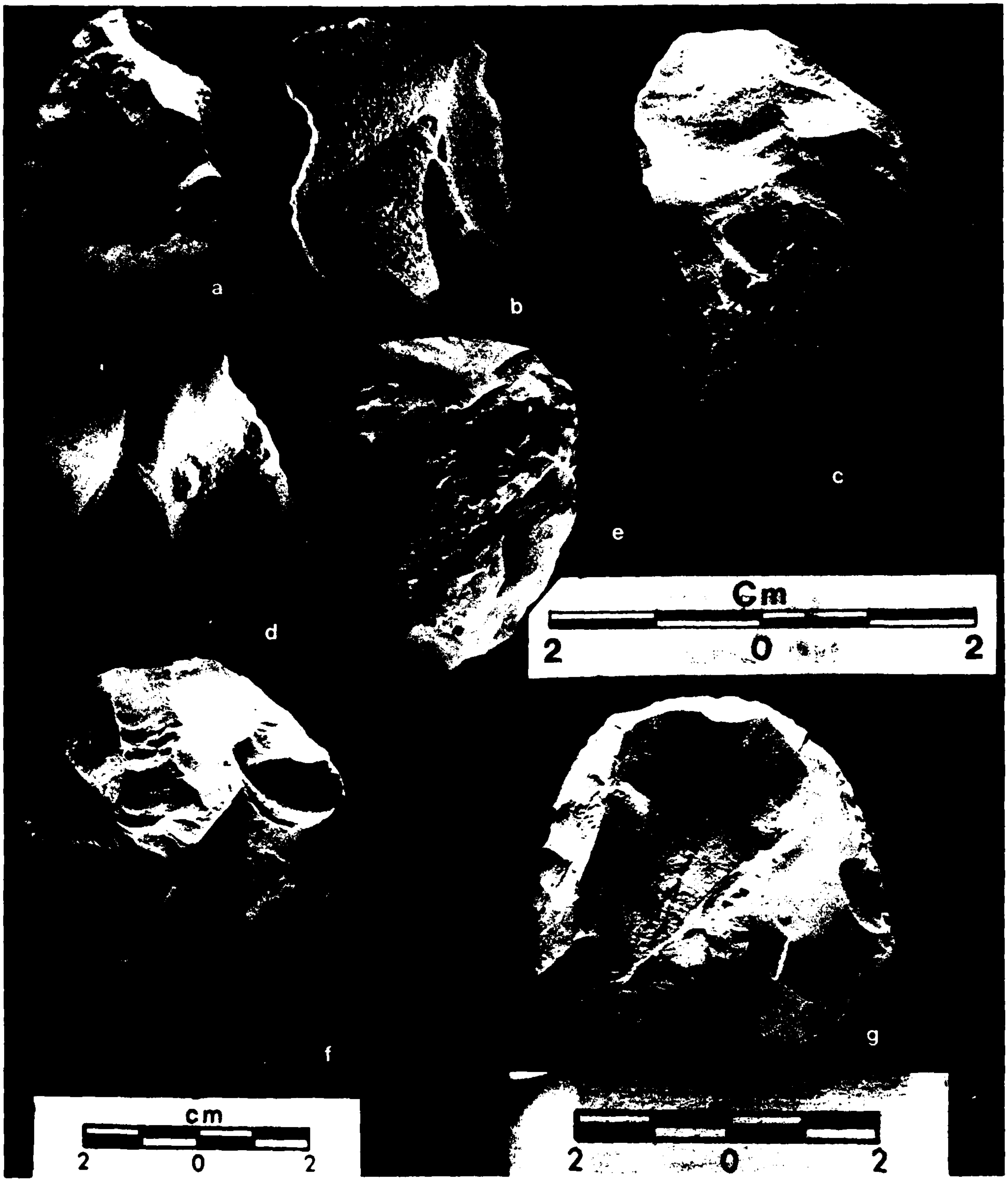

Figure 30. Small flake projectile points (a-c), small trapezoidal-shaped flake scrapers (d-e), large flake scrapers (f-g): a) X-2009, Level 4; b) X-191, Level 9; c) X-456, Level 4; d) X-2008, Level 4; e) X-12, Level 4; f) X-4, Level 5; g) X-2009, Level 6.

Sample size = 12	Figure 30a-c.
Provenience:	
Area V = X-1054, L-4	Area VI = X-456, L-4
X-1008, L-1	
X-1057, L-2	Area VIII = X-335, L-1
X-1053, L-2	X-106, L-8
X-1051, L-4	X-191, L-9
X-1046, L-4	
	Area IX = X-2009, L-4
	X-2008, L-4
Range in variation (cm):	Length = 4.92 [?] Width = 3.45 [?] Thickness = 0.31-1.54
Mean (cm):	Length = 4.92 Width = 3.45 Thickness = 0.84
Standard deviation (cm):	Length = 0.88 Width = 0.50 Thickness = 0.39
Shape:	Variable
Cross section:	Convex-flat
Edges:	Variable
Material:	Opaque obsidian = 3 (25.00%) Chert = 8 (66.67%) Basalt = 1 (8.33%)
Luster:	Vitreous to waxy
Method of manufacture:	Fine pressure flaking on one or more edges, unifacially flaked, no re-shaping of the original flake.

(II) Small Isosceles Trapezoidal-Shaped Scrapers. Three purposefully shaped trapezoidal scrapers [Figure 30d-e] were found at the site by the Eastern Washington University archaeologists; one during the 1980 field season and two additional examples during the following 1981 field season. All of the scrapers have been shaped and subsequently retouched on all edges. The widest or longest edge has been unifacially flaked and retouched to produce a stout, high-angled edge. Again chert appears to be the preferred material for the manufacture of these tools as only one example was made of obsidian, the material predominately used at the Hagerman locale.

Sample size = 3	Figure 30d-e.
Provenience:	
Area V = X-1052, L-5	Area VII = X-12, L-4
Area IX = X-2008, L-4	
Range in variation (cm):	Length = 2.72-3.12 Width = 2.48-2.70 Thickness = 0.70-0.88
Mean (cm):	Length = 2.91 Width = 2.60 Thickness = 0.80
Standard deviation (cm):	Length = 0.20 Width = 0.11 Thickness = 0.09
Shape:	Isosceles trapezoidal
Cross section:	Convex-flat
Edges:	Variable to slightly convex
Material:	Opaque obsidian = 1 (33.33%) Chert = 2 (66.67%)
Luster:	Vitreous to waxy
Method of manufacture:	Fine pressure flaking on all edges, unifacially flaked to a trapezoidal shape with the widest edge prepared and purposefully retouched to produce a high, stout, inclined angle.

(III) Bifacial-Unifacial Flake Scrapers. The four large bifacially flaked and subsequently unifacially flaked scrapers have been assigned to this category by the investigators. All four of the examples found were made of chert (3; 75.00%) or basalt (1; 25.00%). None were made from the most commonly found material, obsidian, which appears to dominate in all of the other flaked stone categories. All of the examples found were made from very large flakes struck from large cores, and all of the specimens have been unifacially flaked to produce a high, stout, inclined, angled edge. These scrapers also exhibit step fractures on the ventral face as do some of the trapezoidal types, suggesting their use as scraping tools (see Butler 1978:Figure 27).

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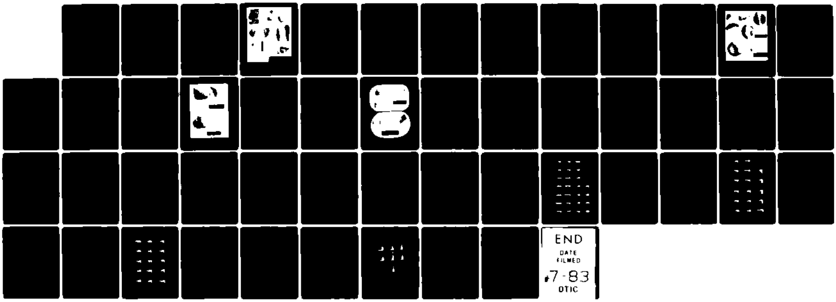

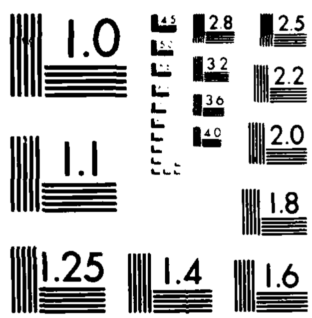
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4.0

Sample size = 4	Figure 30f-g.
Provenience:	
Area V = X-1046, L-4	Area VI = X-4, L-5
Area IX = X-2006, L-5 X-2009, L-6	
Range in variation (cm):	Length = 3.14-7.48 Width = 2.14-6.02 Thickness = 0.93-1.74
Mean (cm):	Length = 5.09 Width = 3.92 Thickness = 1.32
Standard deviation (cm):	Length = 1.97 Width = 1.75 Thickness = 0.39
Shape:	Ovate to slightly triangular
Cross section:	Convex-flat
Edges:	Convex
Material:	Chert = 3 (75.00%) Basalt = 1 (25.00%)
Luster:	Dull waxy
Method of manufacture:	Percussion and pressure flaking on all edges, some examples purposefully reshaped to an ovate form, retouching of one or mored edges to produce a stout, inclined angle.

Flake and Blade Cores, Chunks, and Core Tablets

Four different types of cores and core fragments have been obtained from the Hagerman site. These include exhausted flake cores and chunks, flake cores, blade cores, and what appears to be a core tablet removed from a blade core. All four of these cores and core fragments have been reported from the region by other investigators (Swanson 1972:95; Gruhn 1961a:190-191; Pavesic and Meatte 1980:63-64). The blade core and core tablet are particularly interesting because these cores do not appear with great frequency in the northern Great Basin or in the nearby Columbia Plateau. Swanson (1972:81), for example, collected only 10 conical cores and core

fragments and 6 wedge-shaped cores and core fragments from all of the excavated levels at the Bison and Veratic rockshelters. It is not surprising therefore, that only five questionable (?) blade cores were found at the Hagerman site. Simple flake cores (9; 33.33%) and exhausted cores and chunks (13; 48.15%), however, are very common at the Hagerman location making up a total of 81.48% of the total number of cores and core fragments found.

(I) Exhausted Cores and Chunks. The exhausted cores and chunks, 13 examples, consist of pieces of opal (1; 7.7%), jasper (5; 38.46%), chert (3; 23.08%), basalt (2; 15.39%), and obsidian (2; 15.39%), from which flakes have been purposefully removed. None of these fragments were very large, having a maximum length of under 5.00 cm. All of the chunks and exhausted cores exhibit a random flaking pattern over the entire surface [Figure 31a] with the flakes often removed from an unprepared platform [Figure 31b].

Sample size = 13

Figure 31a-b.

Provenience:

Area V = X-1045, L-3
X-1052, L-4

Area VIII = X-145, L-4 (2)
X-191, L-9

Area IX = X-2008, L-4
X-2005, L-7

Area VI = X-1, L-1 (2)
X-1, L-3
X-2, L-2
X-420, L-3
X-468, L-2

Range in variation (cm):

Length = 2.15-4.58
Width = 1.52-3.02
Thickness = 0.80-2.08

Mean (cm):

Length = 3.09
Width = 2.13
Thickness = 1.45

Standard deviation (cm):

Length = 0.69
Width = 0.46
Thickness = 0.35

Figure 31. Exhausted flake cores and chunks (a-b), blade cores (c-d), core tablet (e), blades (f-i), and flake perforator (j): a) X-1054, Level 2; b) X-1044, Level 2; c) X-183, Level 7; d) X-2010, Level 6; e) X-2005, Level 7; f-g) X-1039, Level 3; h) X-1042, Level 3; i) X-2004, Level 5; j) X-2007, Level 4.

Shape:	Variable to subangular blocky
Cross section:	Blocky to rectangular, cuboidal
Edges:	NA
Colors:	Variable; black, N 2.5 to N 3; dusky red, 10R 3/4; brown, 7.5YR 4/2; dk. yellowish brown, 10YR 4/4; gray, N4; olive, 5Y 4/3
Material:	Jasper = 5 (38.46%) Chert = 3 (23.08%) Basalt = 2 (15.39%) Obsidian = 2 (15.39%) Opal = 1 (7.67%)
Luster:	Vitreous to dull to waxy
Method of manufacture:	Percussion flaking on all surfaces, soft hammer.

(II) Flake Cores. Of the 29 cores and core fragments recovered from the Hagerman site, 10 fragments have been assigned to the flake core category. These fragments differ from the chunks and exhausted core category by the presence of what are large flake scars on all of the surfaces and by their discoidal shape. Whereas the exhausted core and chunk category exhibits a blocky structure, the flake cores tend to be more ovate in form with flakes removed from two primary faces.

Sample size = 10

Provenience:

Area V = X-1044, L-2
X-1054, L-2
X-1046, L-5
X-1052, L-4 (2)

Area VI = X-2, L-4
X-440, L-4
X-468, L-2

Area VIII = X-144, L-4
X-225, L-6

Range in variation (cm):	Length = 2.32-3.65 Width = 1.73-3.02 Thickness = 1.31-2.31
Mean (cm):	Length = 3.00 Width = 2.33 Thickness = 1.63
Standard deviation (cm):	Length = 0.46 Width = 0.44 Thickness = 0.36

Shape:	Variable, ovate to discoidal
Cross section:	Double-convex to subangular blocky
Edges:	NA
Colors:	Variable; dusky red, 10R 3/4; black to dk. gray, N 2.5 to N 4; reddish brown, 5YR 5/4; white, 10YR 8/1; olive, 5Y 8/1
Material:	Chert = 4 (44.44%) Jasper = 2 (22.22%) Obsidian = 2 (22.22%) Opal = 1 (11.11%)
Luster:	Vitreous to waxy
Method of manufacture:	Large flakes removed from all surfaces, percussion flaking only.

<u>(III) Blade Cores and Fragments</u>. Blade cores constitute a very small portion of the flaked stone assemblage present at the Hagerman site. Only five blade cores have been recovered, and there is some question as to their validity as true blade cores. All of the examples found exhibit parallel flaking [Figure 31c-d] and what appears to be prepared striking platforms.

Sample size = 5 Figure 31c-d.

Provenience:

Area V = X-1046, L-5	Area VI = X-406, L-5 X-407, L-3
Area VIII = X-183, L-7	Area IX = X-2010, L-5

Range in variation (cm):	Length = 1.56-2.88 Width = 1.21-2.38 Thickness = 0.81-1.68
Mean (cm):	Length = 2.22 Width = 1.72 Thickness = 1.22
Standard deviation (cm):	Length = 0.52 Width = 0.51 Thickness = 0.38
Shape:	Variable
Cross section:	Subangular blocky
Edges:	NA
Colors:	Black, N 2.5; olive, 5Y 4/3; white, 10YR 8/1

Material:	Obsidian = 2 (40.00%) Chert = 2 (40.00%) Opal = 1 (20.00%)
Luster:	Vitreous to waxy
Method of manufacture:	Small narrow parellel flakes removed from cores on one face. Some evidence of prepared core platforms.

(IV) Core Tablets. Core tablets are prepared core platforms removed from the parent blade cores. Core platforms are removed when they no longer function adequately as striking platforms, or when the size of the core is to be reduced to produce smaller blades. The core is usually set up so that the top section, the platform damaged by step fractures on the working face, can be removed by direct or indirect percussion. What is produced is a "coin-like" tablet with one faceted surface which is polygonal in shape. The core tablet obtained from the Hagerman site appears to be the first tablet removed from a conical core of the type described by Swanson (1972). It has the polygonal shape, the "coin-like" appearance, but lacks the edge damage that is characteristic of core tablets. We would suspect that the prepared surface was removed because the platform was not adequate for blade removal or because the manufacturer wished to reduce the size of the core. Either explanation is plausible at this point in time.

Sample size = 1 Figure 31e.

Provenience:
Area IX = X-2005, L-7

Range in variation (cm):	Length = 2.32 Width = 2.98 Thickness = 1.72
Mean (cm):	Length = 2.32 Width = 2.98 Thickness = 1.72
Standard deviation (cm):	Length = NA Width = NA Thickness = NA

Shape:	Coin-like with polygonal sides
Cross section:	Disk
Edges:	NA
Colors:	Black, N 2.5
Material:	Obsidian = 1 (100.00%)
Luster:	Vitreous
Method of manufacture:	Thin flakes removed from surface so as to produce a faceted face on the striking platform and subsequent removal of the tablet by direct or indirect percussion.

Blades

Eight blades have been collected from the Hagerman National Fish Hatchery site. These "Blades" exhibit all of the features common to blades struck from prepared conical cores. These include crushed and faceted proximal ends, a length twice as long as the blade is wide, one or more ridges or arisses, and a blade that usually terminates in a feather-like edge. All of the blades obtained from the site exhibit some of these features and those that do not apparently were broken, and the portion containing the features lost to the investigators [Figure 31f-h]. One of the blades collected from the site exhibits secondary retouch along one of its edges [Figure 31i]. This retouch appears to be use-retouch as opposed to purposeful retouch as no definite patterned flaking appears on the blade.

Sample size = 8 — Figure 31f-i.

Provenience:

Area V = X-1046, L-3
X-1042, L-3
X-1039, L-3 (2)

Area VI = X-407, L-2 (2)
X-420, L-1

Area IX = X-2004, L-5

Range in variation (cm):
Length = NA
Width = 0.96-1.56
Thickness = 0.18-0.41

Mean (cm):
Length = NA
Width = 1.20
Thickness = 0.28

Standard deviation (cm):	Length = NA Width = 0.23 Thickness = 0.08
Shape:	Long rectangular
Cross section:	Convex-flat to triangular-flat
Edges:	NA
Colors:	Black, N 2.5; white, 5YR 8/1; dk. reddish-brown, 5YR 3/3; light gray 5YR 7/1
Material:	Chert = 5 (62.50%) Obsidian = 2 (25.00%) Basalt = 1 (12.50%)
Luster:	Vitreous to waxy
Method of manufacture:	Percussion-produced blades struck from conical cores. Some secondary retouch on one example.

Peforators and Drills

One flake modified to produce a pointed perforator or drill was collected at the site. This one example is similar to the perforators obtained from the Birch Creek locality by Swanson (1972:117). These perforators are finely retouched on the pointed end and on both faces, are usually made from flakes, and exhibit some use-retouch in the form of step-like flakes perpendicular to the working end. The one example we have assigned to this category (one of the retouched flakes may have also been used as a perforator) was made of obsidian. The greater number of these artifacts found at the Birch Creek locality by Swanson (1972), however, were made of chalcedony, ignimbrite, and chert. None of the examples collected by Swanson were of obsidian. Swanson (1972:123) suggests that the perforators were made by the application of a burin-like blow directed from the end of the flake. An examination of the Hagerman example indicates that both a burin-like blow and a side impact on one of the flake faces was used to produce the perforator.

Sample size = 1	Figure 31j.
Provenience:	
Area IX = X-2007, L-4	
Range in variation (cm):	Length = 3.28 Width = 2.12 Thickness = 0.58
Mean (cm):	Length = 3.28 Width = 2.12 Thickness = 0.58
Standard deviation (cm):	Length = NA Width = NA Thickness = NA
Shape:	Variable
Cross section:	Convex-flat
Edges:	NA
Colors:	Black, N 2.5
Material:	Obsidian = 1 (100.00%)
Luster:	Vitreous
Method of manufacture:	Two small flakes removed from one end of the primary flake; one by a burin-blow directed at the edge of the flake, the other by a blow directed at the side of the flake.

Ground Stone Materials

The ground stone debris collected from the Hagerman National Fish Hatchery site included a large quantity of ground stone fragments, some of which appear to be fire-cracked, utilized and dented cobbles, shaped manos and grinding stones, grinding slab fragments, and what we have called pottery (burnishing-polishing) stones. None of the items assigned to this group were found associated with any recognizable structural feature at the site, and their function and separation into types was based upon morphological characteristics alone. All of the ground stone tools have been pecked and ground on one or more surfaces either by man or by natural forces, and were utilized subsequently to perform some specific function. By this definition

we have not excluded those natural ground stones utilized as hammerstones, pounders, or grinding slabs.

Ground stone fragments make up the greater portion of the ground stone artifacts collected at the Fish hatchery site. A total of 49 fragments of ground stone and fire-cracked rock were recovered from the units excavated. Unlike the chipped stone artifacts which employed obsidian as the primary source material, the ground stone artifacts were largely made from igneous and metamorphosed rocks such as basalt, quartzite, jasper, and granite (Hamilton et al. 1974:146-149). All of the examples found have one or more polished surfaces and have been broken through use or by fire in a hearth [Figure 32a-b].

Sample size = 49

Figure 32a-b.

Provenience:

Area V = X-1014, L-1
X-1016, L-2
X-1023, L-2
X-1025, L-1
X-1026, L-1
X-1029, L-2
X-1031, L-1
X-1033, L-1
X-1036, L-4
X-1043, L-2
X-1046, L-3 (4)
X-1048, L-1
X-1048, L-3
X-1052, L-3
X-1054, L-4

Area IX = X-2006, L-5
X-2006, L-6

Area X = X-3012, L-1

Area VI = X-406, L-2 (3)
X-407, L-3
X-407, L-4
X-419, L-2 (3)
X-419, L-3
X-440, L-1
X-491, L-3
X-492, L-2
X-492, L-3 (3)
X-503, L-2
X-549, L-3
X-649, L-3

Area VIII = X-105, L-2 (2)
X-106, L-4
X-106, L-5
X-111, L-2
X-112, L-1
X-116, L-5
X-131, L-3
X-182, L-3
X-226, L-3

Range in variation (cm):

Length = 1.88-13.96
Width = 1.58-11.42
Thickness = 0.51-9.94

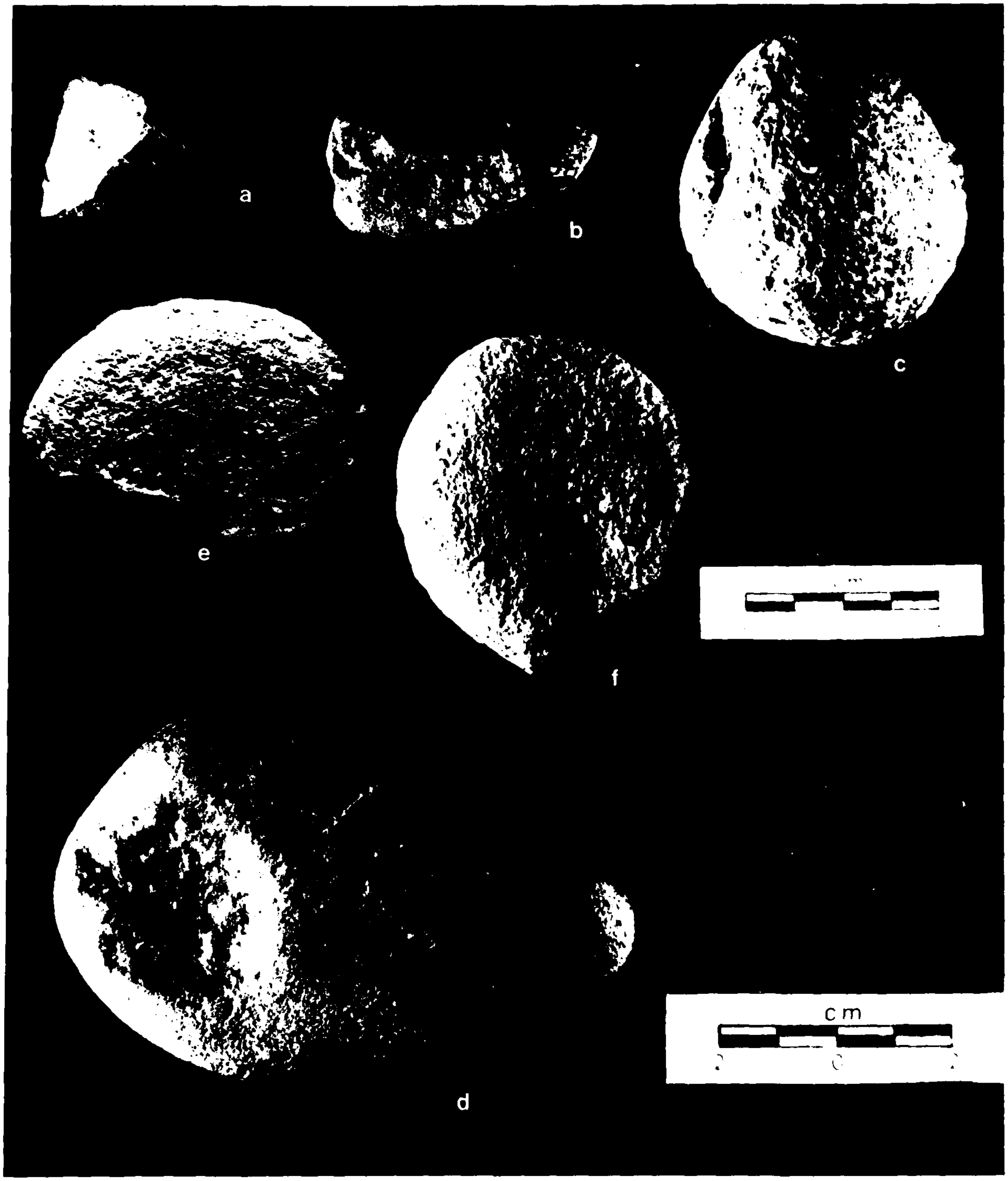

Figure 32. Fire-cracked rock (a-b) and ground stone (c-f): a) X-1025, Level [illegible]; b) X-503, Level 2; c) broken hammerstone, X-1009, Level 1; d) utilized cobble, X-594, Level 4; e) disk-shaped, X-10[illegible], Level [illegible]; f) disk-shaped, X-235, Level 2.

Mean (cm):	Length = 4.62 Width = 3.45 Thickness = 2.12
Standard deviation (cm):	Length = 2.51 Width = 1.90 Thickness = 1.75
Shape:	Variable
Cross section:	Cuboidal--subangular blocky
Edges:	NA
Colors:	Gray, N 3 to N 5; weak red, 10R 4/3 to 10R 5/2; pinkish-gray, 7.5YR 6/2; reddish-gray, 7.5YR 6/2 [?]; pink, 7.5YR 8/4; dk. brown, 7.5YR 3/2; lt. brown, 7.5YR 6/4
Material:	Basalt = 42 (85.71%) Felsite = 2 (4.08%) Jasper = 2 (4.08%) Quartzite = 2 (4.08%) Sandstone = 1 (2.04%)
Method of manufacture:	Broken through use or by fire used by the inhabitants of the site.

Utilized Cobbles--Hammerstones

Three dented and pitted utilized river cobbles were recovered from the Hagerman site. These cobbles exhibit denting and pitting on one or more of the edges and ends. One example collected from Area VI was dented and pitted on both of the opposite longitudinal ends and on one of the faces [Figure 32d]. None of the cobbles assigned to this class of artifacts appears to have been purposefully shaped, nor do any of the examples exhibit any edge grinding of any kind. It would appear that all of the objects assigned to this class were obtained locally from nearby Riley Creek.

Sample size = 3 Figure 32c-d.

Provenience:

Area V	= X-1009, L-1 X-1044, L-4	Area VI	= X-594, L-4

[Apparently only one example measurable.]

Range in variation (cm):	Length = 10.54 Width = 6.84 Thickness = 4.14
Mean (cm):	Length = 10.54 Width = 6.84 Thickness = 4.14
Standard deviation (cm):	Length = NA Width = NA Thickness = NA
Shape:	Ovate, round egg-shaped
Cross section:	Circular to convex-flat
Edges:	Rounded-convex
Colors:	Reddish-gray, 10R 5/1
Material:	Basalt = 3 (100.00%)
Luster:	Dull
Method of manufacture:	Utilized river cobble, exhibiting use denting and pitting.

Manos or Grinding Stones

Two types of hand stones, used to grind up roots, berries, and vegetable matter, have been defined by the writers [Lothson, Linse, and Virga]: 1) a disk-shaped circular type (4 examples; 44.44%); and 2) a cylindrically-shaped rolling pin type (5 examples, 55.56%). These two grinding stones differ not only in general shape, but also in function and in the material used to manufacture them. All of the disk-shaped grinding stones were made from basalt, whereas two of the cylindrical types (22.22%) were made from pinkish granite (ignimbrite?). Unlike the utilized cobbles and hammerstones, these grinding stones have been purposefully shaped into the disk and cylindrical shapes. In addition, some of the examples also were used as hammerstones, as they exhibit denting and pitting on the edges and on the longitudinal ends.

<u>(I) Disk-Shaped Grinding Stones</u>. A total of four circular, broken and fragmented disk-shaped grinding stones were collected by the excavation crew. These discoidal grinding stones are ovate to circular in shape, have rounded edges, have a finely polished surface in some cases, are double-convex in cross section, and some examples exhibit pitting on the faces and on the edges. As noted above, all of the specimens assigned to this class of artifacts were made of basalt and were collected from Areas VI and VIII. The absence of these objects from the other tested areas could be significant. Swanson (1972:128), recovered nine of these stones from the Birch Creek sites. He notes that hand stones of this kind are widespread throughout southern Idaho, whereas the edge ground cobbles are common to the Plateau and in the adjacent northern Idaho area (Swanson 1972:124). Swanson and Sneed (1971), Swanson et al. (1964), and Swanson et al. (1959) have reported hand stones of this kind from a number of southern Idaho sites.

Sample size = 4   Figure 32e-f.

Provenience:
Area VI = X-492, L-3   Area VIII = X-239, L-2
X-104, L-1 (2)

Measurements: Not applicable (all examples were fragmentary)

Shape:	Ovate to round circular
Cross section:	Double-convex
Edges:	Rounded and convex
Colors:	Gray, N 3 to N 4.
Material:	Basalt = 4 (100.00%)
Method of manufacture:	Ground and polished on all surfaces.

<u>(II) Cylindrical-Shaped Grinding Stones</u>. Five cylindrical-shaped grinding stones, similar to those described and illustrated by Swanson (1972:128) were collected from the site by the investigators. These cylindrical-shaped stones, like the disk-shaped grinding stones, were fragmented, and no whole

examples were found. All of the artifacts are ovate to convex-flat in cross section, were purposefully shaped by grinding and polishing, and all of the examples exhibit denting and pitting on one or more surfaces. Unlike the disk-shaped stones, two of these were made of granite (ignimbrite?) obtained from localized Bonneville flood gravel deposits.

Sample size = 5 Figure 33a.

Provenience:
Area VIII = X-106, L-0
X-131, L-0
X-226, L-3
X-239, L-3
Area X = X-2005, L-6

Measurements: Not applicable (all examples were broken)

Shape:	Cylindrical
Cross section:	Ovate to convex-flat
Edges:	Rounded
Colors:	Gray, N 3 to N 4; pinkish-white, 5YR 8/2
Material:	Basalt = 3 (60.00%) Granite = 2 (40.00%)
Method of manufacture:	Ground and polished on all surfaces.

Grinding Slabs and Mortars

During the initial investigation of the Hagerman site by Pavesic and Meatte (1980), a significant number of large mortars and grinding slabs were found. Many of these objects were collected from Excavation Areas I and II--areas that contain significant archaeological resources which are to be avoided by the construction activities planned for the site. Pavesic and Meatte (1980:70-71) have described two basic types (varieties) that they have called the Basin variety and the Saucer variety. Only a fragmentary portion of the Saucer type was found by the 1981 field investigation. Pavesic and Meatte (1980:71) describe these as:

> Tabular subangular blocks with a ground/polished dish-shaped surface. Not possible to determine direction of grinding motion. One specimen contains a deep trough and has red ochre staining on the reverse side.

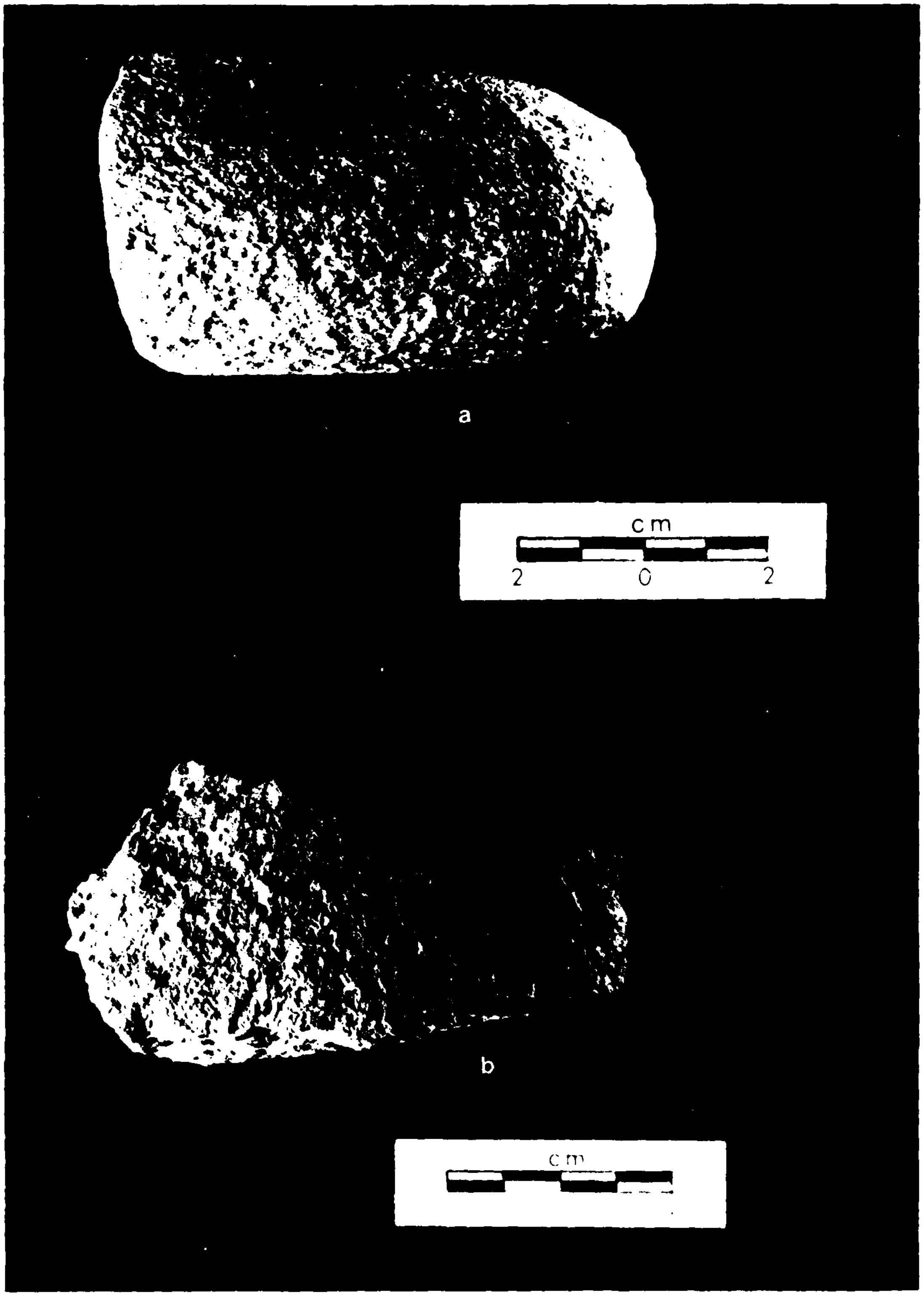

Figure 33. Cylindrical ground stone fragment (a) and a saucer-shaped grinding slab fragment (b): a) X-106, surface; b) X-594, Level 3.

The fragmentary example collected by the writers was made of basalt as were the specimens collected by Pavesic and Meatte (1980:71). Unlike the Saucer shape of slabs obtained by Pavesic and Meatte, however, the sample collected during the 1981 field season was so fragmentary that its general shape and size could not be reconstructed or measured. The classification of the example is based, therefore, upon the description cited in the Pavesic and Meatte report.

Sample size = 1 Figure 33b.

Provenience:
Area VI = X-594, L-3

Measurements: Not applicable (this example was broken)

Shape:	Saucer-shaped
Cross section:	Disk-saucer shaped--concave-convex
Edges:	NA
Colors:	Gray, N 3
Material:	*Basalt = 1 (100.00%)*
Method of manufacture:	Ground and pecked on all surfaces.

<u>Pottery (Burnishing and Polishing) Stones or Pebble Pestles</u>

Several highly polished rectangular and ovate-cylindical stones that may have been utilized as pottery burnishing or polishing stones have been collected at the Hagerman National Fish Hatchery site. Swanson (1972:129) illustrates several ground stone objects he calls pebble mortars at the Birch Creek locality. If these objects are indeed pebble mortars, one would assume that pebble-sized pestles would also be part of the cultural inventory of the inhabitants. The stones which we have assigned to the pottery stone class could be small pestles, but we tend to favor the other explanation for a number of reasons. All of the surfaces of these stones are highly polished, as if they had to be worked against very fine grit or clay. Stones of this kind are often found in Southwestern and Midwestern

cultural assemblages where ceramics are a major element of the assemblages. Pavesic and Meatte (1980:69) found only one such polishing stone, which was described as a "rounded rectangular cobble with polishing and smoothing on the widest surface extending to the sides."

Sample size = 10 — Figure 34a-d.

Provenience:

Area V	= X-1024, L-2	Area VI	= X-407, L-3 (2)
	X-1051, L-2		X-407, L-4
	X-1051, L-4		X-441, L-4
	X-1045, L-3		X-492, L-3
Area VIII	= X-109, L-4		

Range in variation (cm):	Length = 5.84-6.10 Width = 2.58-4.23 Thickness = 0.81-2.48
Mean (cm):	Length = 6.34 Width = 2.96 Thickness = 1.43
Standard deviation (cm):	Length = NA Width = 0.65 Thickness = 0.66
Shape:	Ovate long rectangular
Cross section:	Ovate to subangular blocky
Edges:	Rounded
Colors:	Brown, 7.5YR 5/4; very dark gray, N 3 to N 4
Material:	Basalt = 6 (60.00%) Felsite = 3 (30.00%) Sandstone = 1 (10.00%)
Luster:	Dull to very slightly vitreous
Method of manufacture:	Ground and polished on all surfaces.

Ceramics

The ceramic materials (pottery) collected from the site, according to Pavesic and Meatte (1980:66-68), consist of two basic types: 1) Shoshoni ware, and 2) southern Idaho Plain ware. They describe these two wares as:

> (1) Shoshoni ware . . .
> Well made plain pottery; temper is sand quartz and/ or mica, surface is smooth to undulating exhibiting some

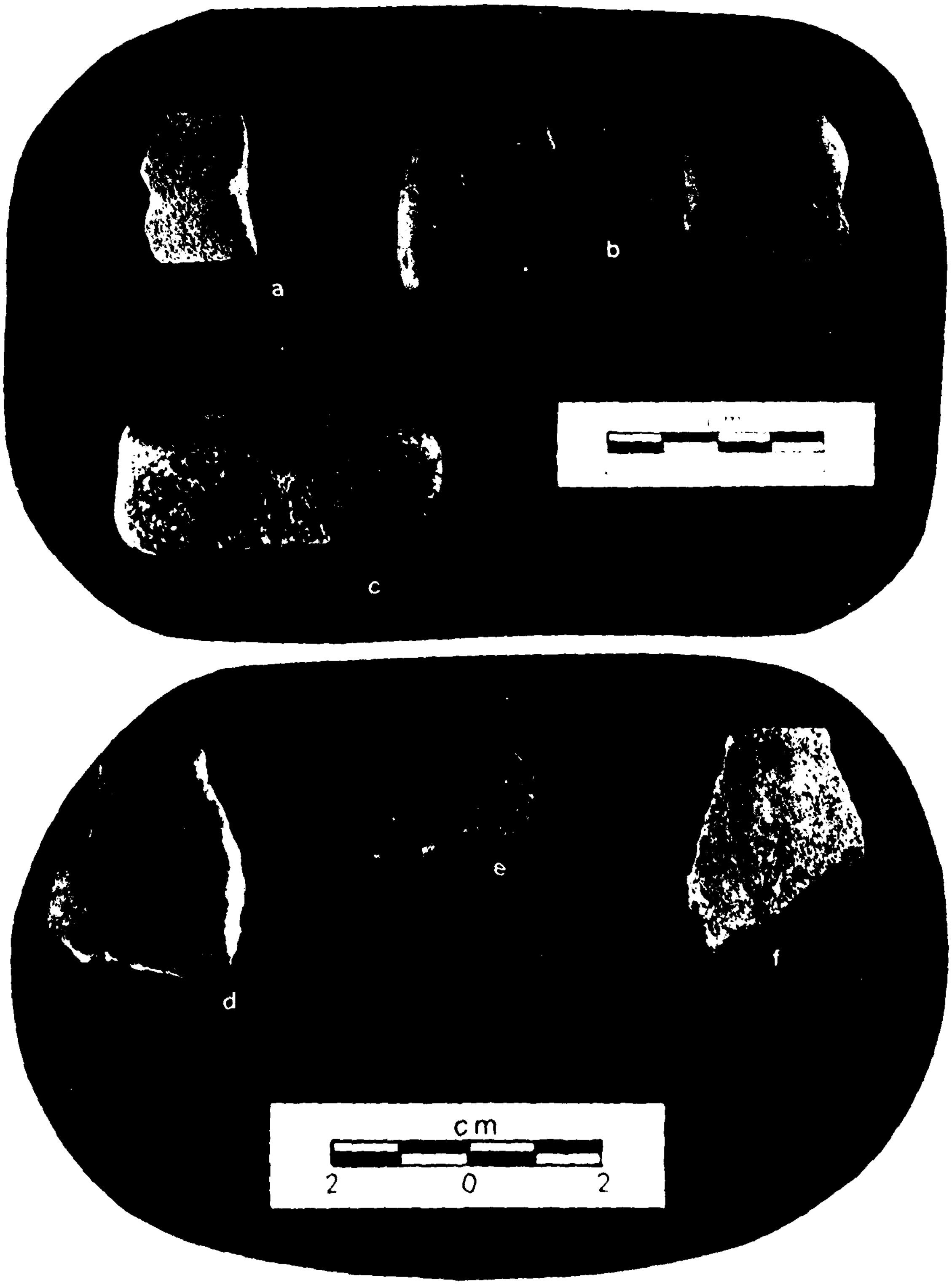

Figure 35. Pottery burnishing stones (a-c) and rim sherds from smooth-surfaced pottery (d-f): a) X-1024, Level 2; b) X-1051, Level 4; c) X-1043, Level 4; d) X-1013, Level 2; e) X-144, Level 7; f) X-2006, Level 5.

striations and possible wiping by plant material, interior surface has striations and carbon buildup, interior color varies from black to beige, surface color grey to beige, core color is grey to beige. A number of sherds exhibit "flaking". A few are flattened basal piece fragments and two pieces have holes drilled or punched through the pottery wall.

(2) Southern Idaho Plain ware . . .
Two body and two rim sherds of a heavy ware; temper is coarse quartz to sand and quartz, surface finish is smooth with a slight polish or burnish, interior exhibits some striations, surface color is reddish brown, grey or black, interior color is grey to black with heavy carbon buildup, core color grey to red-brown. Rim sherds are incurvate to body.

The ceramics collected from the site during the 1981 field season largely were southern Idaho Plain ware [Figure 34e-g]. All of the examples that were found were reddish-brown (5YR 5/3) to dark brown (7YR 5/2) in color, and had a smooth surface and the characteristic charred interior. Some of the examples found had the undulating, smooth surface that is common to the Shoshoni wares. Of the 11 sherds found, seven appear to belong to the southern Idaho Plain ware category, and the remaining four sherds to the Shoshoni ware category. One clay fragment of unknown function also was recovered from the site. This fragment was 2.54 cm at its longest and 0.38 cm thick.

Sample size = 11 Figure 34e-g.

Provenience:

Area V	= X-1010, L-2 (2)	Area VIII	= X-144, L-7 (2)
	X-1013, L-2		
	X-1016, L-2	Area IX	= X-2006, L-5
	X-1047, L-3		X-2010, L-4
			X-2011, L-1
			X-2011, L-4

Range in variation (cm): Max. dimension = 1.22-3.28
Max. thickness = 0.54-0.93

Mean (cm): Max. dimension = 2.62
Max. thickness = 0.75

Standard deviation (cm):	Max. dimension = 0.61 Max. thickness = 0.14
Shape:	Variable
Cross section:	Curved rim sherds and body sherds
Edges:	NA
Colors:	Reddish-brown, 5YR 5/3; reddish-grey, 5YR 5/2; dk. reddish-grey, 5YR 4/2; weak red, 10R 5/3 and 10R 4/2; brown, 7YR 5/2
Temper:	Grit, sand, and mica
Surfaces:	Smooth, often striated, carbonized interior, some sherd splitting and flaking.

APPENDIX C

THE ARCHAEOLOGICAL DEPOSITS AND SEDIMENTS AT THE HAGERMAN NATIONAL FISH HATCHERY SITE (10GG176)

Ricky Linse and Gordon A. Lothson

APPENDIX C

THE ARCHAEOLOGICAL DEPOSITS AND SEDIMENTS AT THE HAGERMAN NATIONAL FISH HATCHERY SITE (10GG176)

by

Ricky Linse and Gordon A. Lothson

During the archaeological investigations at the Hagerman National Fish Hatchery, 56 soil samples from four of the five test areas were collected and analyzed. Area X was not sampled since this area contained so little cultural material. The purpose of the investigation was to identify the depositional environment of the associated artifacts and to determine the degree of cultural disturbance, if any, at the various test locations.

Three soil depositional units were recognized: 1) undisturbed overbank sediments, 2) a soil horizon containing overbank sediments slightly disturbed by recent utilization of the fish hatchery, and 3) a horizon containing soil redeposited during construction of the original fish hatchery complex. Granulometric analysis of the sediments collected from the test areas clearly illustrated the differences between these depositional units (Table 23).

The redeposited materials are usually poorly to moderately well-sorted, coarse-grained, and contain relatively high frequencies of gravel-sized particles. The slightly disturbed overbank sediments contain relatively high frequencies of gravel, are moderately to moderately well-sorted, and vary from coarse-grained to fine-grained (Tables 23 and 24). The undisturbed overbank sediments are moderately well-sorted, increase in grain size with depth, and

Table 23. Granulometric Analysis of Sediments by Size and Percent.

Sample No.	Depth (cm)	Gravel 62-2 mm	Sand 2-0.063 mm	Silt 0.063-0.004 mm
		AREA V, X-1004		
25*	0-5	0.9	81.7	17.4
24*	5-10	0.9	80.7	18.3
23	10-15	0.6	78.6	20.9
22	15-20	0.7	73.0	26.1
21**	20-25	0.5	60.3	38.3
20	25-30	0.4	74.8	24.8
19	30-35	-	83.7	16.3
18	35-40	-	83.29	16.7
17	40-45	0.04	85.76	14.1
16	45-50	-	81.37	18.63
15	50-55	-	75.35	24.2
14	55-60	-	75.7	24.1
13	60-65	0.14	74.4	25.4
12	65-70	0.19	61.8	38.0
11	70-75	0.17	56.7	43.1
10	75-80	0.12	59.0	40.9
9	80-85	0.07	68.1	31.9
8	85-90	0.03	74.3	25.7
7	90-95	-	79.69	20.3
6	95-100	-	76.01	23.9
5	100-105	0.08	72.3	27.7
4	105-110	0.1	65.5	34.4
3	110-115	0.16	57.34	37.7
2	115-120	0.13	48.2	51.7
1	120-125	0.11	40.7	59.2
		AREA VI, X-593		
19	0-5	7.45	70.61	21.93
18	5-10	13.43	62.7	23.84
17	10-15	19.16	60.29	20.54
16	15-20	3.51	69.16	27.31

Table 23. (Continued)

Sample No.	Depth (cm)	Gravel 62-2 mm	Sand 2-0.063 mm	Silt 0.063-0.004 mm
15	20-25	3.08	57.54	39.37
14	25-30	2.61	60.16	37.22
13	30-35	1.92	63.34	34.73
12	35-40	1.48	68.7	32.81
11	40-45	2.07	78.57	19.95
10	45-50	3.42	81.72	14.83
9	50-55	4.57	84.77	10.66
8	55-60	3.91	81.61	14.46
7	60-65	2.78	72.52	24.69
6	65-70	2.01	72.19	25.77
5	70-75	1.12	71.86	27.01
4	75-80	1.57	71.75	26.34
3	80-85	1.9	74.7	23.4
2***	85-90	-	-	-
1***	90-95	-	-	-
		AREA VIII, X-191		
15	0-5	6.27	78.26	13.46
14	5-10	5.4	77.73	16.87
13	10-15	3.39	81.77	14.83
12	15-20	3.24	83.24	13.51
11	20-25	2.49	84.52	12.98
10	25-30	2.38	83.56	14.06
9	30-35	1.34	87.98	10.69
8	35-40	0.87	81.25	17.01
7	40-45	4.52	77.67	17.78
6	45-50	5.5	74.14	20.36
5	50-55	4.17	68.41	27.41
4	55-60	4.88	72.49	22.64
3	60-65	7.86	81.45	10.69
2	65-70	6.45	79.26	14.28
1	70-75	7.7	78.7	14.09

Table 23. (Continued)

Sample No.	Depth (cm)	Gravel 62-2 mm	Sand 2-0.063 mm	Silt 0.063-0.004 mm
AREA IX, X-2001				
7	0-5	1.2	83.7	14.9
6	5-10	2.1	78.1	21.9
5	10-15	3.1	73.4	23.4
4	15-20	3.9	74.6	21.0
3	20-25	5.3	78.1	16.5
2	25-30	10.9	71.6	17.5
1	30-35	15.5	64.7	19.8

* Slight indication of the presence of organic material
** Clay less than 0.1% by weight
*** Samples contain rock fragments, no analysis

Table 24. Grain Size Statistics.

Sample No.	Depth (cm)	Median Grain Size (phi)	Folk and Ward's Mean Grain Size (phi)	Folk and Ward's Inclusive Graphic Standard Deviation (I)	Folk and Ward's Inclusive Graphic Skewness (Sk_I)	Folk and Ward's Graphic Kurtosis (K_G)
AREA V, X-1004						
25	0-5	3.2	3.23	0.88 Moderately sorted	0.03 Nearly symmetrical	1.02 Mesokurtic
24	5-10	3.3	3.33	0.81 Moderately sorted	-0.05 Nearly symmetrical	1.19 Leptokurtic
23	10-15	3.3	3.23	0.8 Moderately well-sorted	-0.03 Nearly symmetrical	1.0 Mesokurtic
22	15-20	3.1	3.1	0.71 Moderately well-sorted	0 Nearly symmetrical	0.86 Platykurtic
21	20-25	3.2	3.26	0.618 Moderately well-sorted	0.01 Nearly symmetrical	1.31 Leptokurtic
20	25-30	3.4	3.4	0.79 Moderately well-sorted	0 Nearly symmetrical	1.06 Mesokurtic
19	30-35	3.4	3.43	0.61 Moderately well-sorted	0.04 Nearly symmetrical	1.02 Mesokurtic
18	35-40	3.4	3.43	0.59 Moderately well-sorted	0.02 Nearly symmetrical	1.23 Leptokurtic
17	40-45	3.4	3.4	0.51 Moderately well-sorted	0.03 Nearly symmetrical	1.0 Mesokurtic
16	45-50	3.5	3.46	0.55 Moderately well-sorted	-0.045 Nearly symmetrical	1.05 Mesokurtic
15	50-55	3.5	3.53	0.56 Moderately well-sorted	0.02 Nearly symmetrical	1.12 Leptokurtic
14	55-60	3.5	3.53	0.53 Moderately well-sorted	0.07 Nearly symmetrical	1.0 Mesokurtic

Table 24. (Continued)

Sample No.	Depth (cm)	Median Grain Size (phi)	Folk and Ward's Mean Grain Size (phi)	Folk and Ward's Inclusive Graphic Standard Deviation (I)	Folk and Ward's Inclusive Graphic Skewness (Sk_I)	Folk and Ward's Graphic Kurtosis (K_G)
13	60-65	3.6	3.6	0.51 Moderately well-sorted	-0.03 Nearly symmetrical	1.0 Mesokurtic
12	65-70	3.6	3.6	0.52 Moderately well-sorted	0 Nearly symmetrical	0.92 Mesokurtic
11	70-75	3.6	3.6	0.51 Moderately well-sorted	0.03 Nearly symmetrical	1.16 Leptokurtic
10	75-80	3.6	3.6	0.51 Moderately well-sorted	0.03 Nearly symmetrical	1.16 Leptokurtic
9	80-85	3.4	3.56	0.48 Well-sorted	0.41 Very (fine) positive	1.16 Leptokurtic
8	85-90	3.7	3.66	0.58 Moderately well-sorted	-0.05 Nearly symmetrical	1.17 Leptokurtic
7	90-95	3.6	3.63	0.48 Well-sorted	0.13 Positively (fine)	2.32 Very leptokurtic
6	95-100	3.7	3.66	0.48 Well-sorted	-0.07 Nearly symmetrical	1.0 Mesokurtic
5	100-105	3.7	3.7	0.5 Moderately well-sorted	0.02 Nearly summetrical	0.87 Mesokurtic
4	105-110	3.9	3.9	0.38 Well-sorted	-0.13 Negative (course)	2.59 Very leptokurtic
3	110-115	3.8	3.76	0.52 Moderately well-sorted	0.0 Nearly symmetrical	1.06 Mesokurtic
2	115-120	3.7	3.73	0.55 Moderately well-sorted	0.1 Nearly symmetrical	1.02 Mesokurtic
1	120-125	3.6	3.53	0.51 Moderately well-sorted	0.17 Nearly symmetrical	0.97 Mesokurtic

Table 24. (Continued)

Sample	Depth (cm)	Median Grain Size (phi)	Folk and Ward's Mean Grain Size (phi)	Folk and Ward's *Inclusive Graphic* Standard Deviation (I)	Folk and Ward's Inclusive Graphic Skewness (Sk_I)	Folk and Ward's Graphic Kurtosis (K_G)
AREA IV, X-593						
19	0-5	3.6	2.9	1.48 Poorly sorted	-0.62 Very (coarse) negative	1.05 Mesokurtic
18	5-10	3.3	2.56	1.8 Poorly sorted	-0.55 Very (coarse) negative	0.81 Platykurtic
17	10-15	2.6	2.16	1.91 Poorly sorted	-0.28 Negative (coarse)	0.65 Very platykurtic
16	15-20	3.6	2.63	1.8 Poorly sorted	-0.66 Very (coarse) negative	0.79 Platykurtic
15	20-25	3.9	3.6	1.05 Moderately sorted	-0.59 Very (coarse) negative	3.36 Extremely leptokurtic
14	25-30	3.6	3.6	0.88 Moderately sorted	0.23 Very (fine) positive	1.94 Very leptokurtic
13	30-35	3.6	3.66	0.76 Moderately sorted	-0.09 Nearly symmetrical	1.94 Very leptokurtic
12	35-40	3.6	3.63	0.75 Moderately sorted	0.05 Nearly symmetrival	0.93 Mesokurtic
11	40-45	3.3	3.3	0.96 Moderately sorted	-0.12 Negative (coarse)	1.38 Leptokurtic
10	45-50	3.2	3.16	1.02 Moderately sorted	0.22 Negative (coarse)	1.45 Leptokurtic
9	50-55	3.2	3.16	0.99 Moderately sorted	-0.25 Negative (coarse)	1.87 Very leptokurtic
8	55-60	3.4	3.4	1.05 Moderately sorted	-0.19 Negative (coarse)	1.96 Very leptokurtic

Table 24. (Continued)

Sample No.	Depth (cm)	Median Grain Size (phi)	Folk and Ward's Mean Grain Size (phi)	Folk and Ward's Inclusive Graphic Standard Deviation (I)	Folk and Ward's Inclusive Graphic Skewness (Sk_I)	Folk and Ward's Graphic Kurtosis (K_G)
7	60-65	3.5	3.53	0.78 Moderately well-sorted	-0.1 Nearly symmetrical	1.36 Leptokurtic
6	65-70	3.5	3.53	0.75 Moderately well-sorted	-0.06 Nearly symmetrical	1.43 Leptokurtic
5	70-75	3.6	3.6	0.68 Moderately well-sorted	0.02 Nearly symmetrical	1.0 Mesokurtic
4	75-80	3.6	3.6	0.72 Moderately-well-sorted	-0.14 Negative (coarse)	1.43 Leptokurtic
3	80-85	3.6	3.56	0.75 Moderately well-sorted	-0.17 Negative (coarse)	1.28 Leptokurtic
2*	85-90					
1*	90-95					
AREA VIII, X-191						
15	0-5	3.3	3.06	1.18 Moderately sorted	-0.44 Very (coarse) negative	2.1 Very leptokurtic
14	5-10	3.3	3.23	1.08 Moderately sorted	-0.31 Very (coarse) negative	2.05 Very leptokurtic
13	10-15	3.4	3.4	0.84 Moderately sorted	-0.22 Negative (coarse)	1.84 Very leptokurtic
12	15-20	3.3	3.3	0.86 Moderately sorted	-0.2 Negative (coarse)	1.89 Very leptokurtic
11	20-25	3.3	3.26	0.83 Moderately sorted	-0.226 Negative (coarse)	1.5 Leptokurtic
10	25-30	3.3	3.3	0.81 Moderately sorted	-0.22 Negative (coarse)	1.74 Very leptokurtic

Table 24. (Continued)

Sample No.	Depth (cm)	Median Grain Size (phi)	Folk and Ward's Mean Grain Size (phi)	Folk and Ward's Inclusive Graphic Standard Deviation (I)	Folk and Ward's Inclusive Graphic Skewness (Sk_I)	Folk and Ward's Graphic Kurtosis (K_G)
9	30-35	3.3	3.3	0.83 Moderately sorted	-0.14 Negative (coarse)	1.79 Very leptokurtic
8	35-40	3.4	3.33	0.83 Moderately sorted	-0.25 Negative (coarse)	1.45 Leptokurtic
7	40-45	3.3	3.33	1.03 Moderately sorted	-0.17 Negative (coarse)	1.8 Very leptokurtic
6	45-50	3.3	3.26	1.31 Moderately sorted	-0.23 Negative (coarse)	1.73 Very leptokurtic
5	50-55	3.4	3.4	1.32 Moderately sorted	-0.15 Negative (coarse)	1.49 Leptokurtic
4	55-60	3.3	3.4	1.22 Moderately sorted	-0.16 Negative (coarse)	1.64 Very leptokurtic
3	60-65	3.2	2.96	0.91 Moderately sorted	-0.49 Very (coarse) negative	2.05 Very leptokurtic
2	65-70	3.1	3.1	1.0 Moderately sorted	-0.29 Negative (coarse)	2.38 Very leptokurtic
1	70-75	3.3	3.26	1.35 Moderately sorted	-0.35 Very (coarse) negative	3.0 Very leptokurtic

Table 24. (Continued)

Sample No.	Depth (cm)	Median Grain Size (phi)	Folk and Ward's Mean Grain Size (phi)	Folk and Ward's Inclusive Graphic Standard Deviation (I)	Folk and Ward's Inclusive Graphic Skewness (Sk_I)	Folk and Ward's Graphic Kurtosis (K_G)
AREA IX, X-2001						
7	0-5	3.4	3.4	0.66 Moderately well-sorted	0.125 Negative (coarse)	1.41 Leptokurtic
6	5-10	3.5	3.46	0.82 Moderately sorted	-0.19 Negative (coarse)	1.69 Very leptokurtic
5	10-15	3.4	3.4	1.0 Moderately sorted	-0.17 Negative (coarse)	1.82 Very leptokurtic
4	15-20	3.4	3.4	0.97 Moderately sorted	-0.23 Negative (coarse)	1.68 Very leptokurtic
3	20-25	3.3	3.2	1.13 Moderately sorted	-0.29 Negative (coarse)	2.0 Very leptokurtic
2	25-30	3.2	2.8	1.62 Poorly sorted	-0.48 Very (coarse) negative	1.66 Very leptokurtic
1	30-35	3.1	2.43	1.04 Moderately sorted	-0.49 Very (coarse) negative	1.57 Very leptokurtic

* Samples contain rock fragments, no analysis

contain very low frequencies of gravel-sized particles. All four of the tested areas contain one or more of these depositional units.

Area V

Area V, on the easternmost edge of the Hagerman National Fish Hatchery site, contains the slightly disturbed sediments (unit IIa) and the undisturbed overbank sediments (units Ia, Ib, and Ic).

These overbank deposits appear to represent at least three flood episodes of nearby Riley Creek. A comparison of sand, silt, and gravel frequencies indicates water deposition as opposed to wind deposition, as the deposits are well sorted (Table 24), grade from coarse-grained to fine-grained (Figure 35), and are dominated by particles of the 4 phi and 5 phi sizes (Figure 36), indicating water transport for short distances. When the comparative percentage frequencies are plotted (Figure 35), the increasing frequencies of sand and silt (from 40% in Level 1 to 79% in Level 11) is suggestive of a flood episode. Gravel frequencies never exceed 1%, suggesting that deposition occurred in waters of relatively low velocity.

The upper disturbed overbank deposits are not well defined by grain-size analysis. Unit IIa extends to a depth of 30 cm, and the rapid decrease in gravel-sized particles indicates the lower boundary of the disturbed layer (Table 23, Sample 20).

Area VI

Area VI is situated between the concrete raceways and an asphalt parking lot adjacent to the administration building. This area contains two depositional units, i.e., a greatly disturbed unit from 0-35 cm deep and a very slightly disturbed overbank deposit of sand and silt extending to 95 cm.

Levels 1-7, Unit Ia	Increasing frequencies of sand from ca. 40% to 79% is suggestive of increased water flow. Gravel-sized particles also increase in frequency but never exceed 1% in any of the levels. Silt-sized particles decrease in frequency and mean grain size increases with accumulation of the deposit (Table 23).
Levels 8-13, Unit Ib	Decreasing frequencies of sand from the maximum of 79% to 56% and an increase in the silt frequencey from 25% to 43% suggest a slowing of the water velocity. Mean grain size also decreases with the accumulation of sediment and the deposits are well sorted and fine in texture (Table 24).
Levels 14-20, Unit Ic	Sand frequencies in these levels increase to a maximum of 85% and there is a corresponding decrease in the silt frequency to 14%. With the increasing frequency of sand, the frequency of gravel-sized particles increases. These gravel frequencies are very low, suggesting relatively quiet water deposition. It would appear that Levels 14-20 represent a second flood surge
Levels 20-25, Unit IIa	Sand and gravel percentages increase, from a minimum of 60% to a maximum of 81.7% for sand, throughout the deposit, suggesting the onset of a minor flood episode. Unit IIa, however, differs from the units below in that it contains disturbances in the form of buried irrigation pipes, rotted posts, and buried post holes. This disturbance may be reflected in the rapid increase in the gravel frequencies occurring at a depth of 30 cm (Table 23).

Figure 35. Comparison of silt, sand, and gravel, by level, X-1004, Area V.

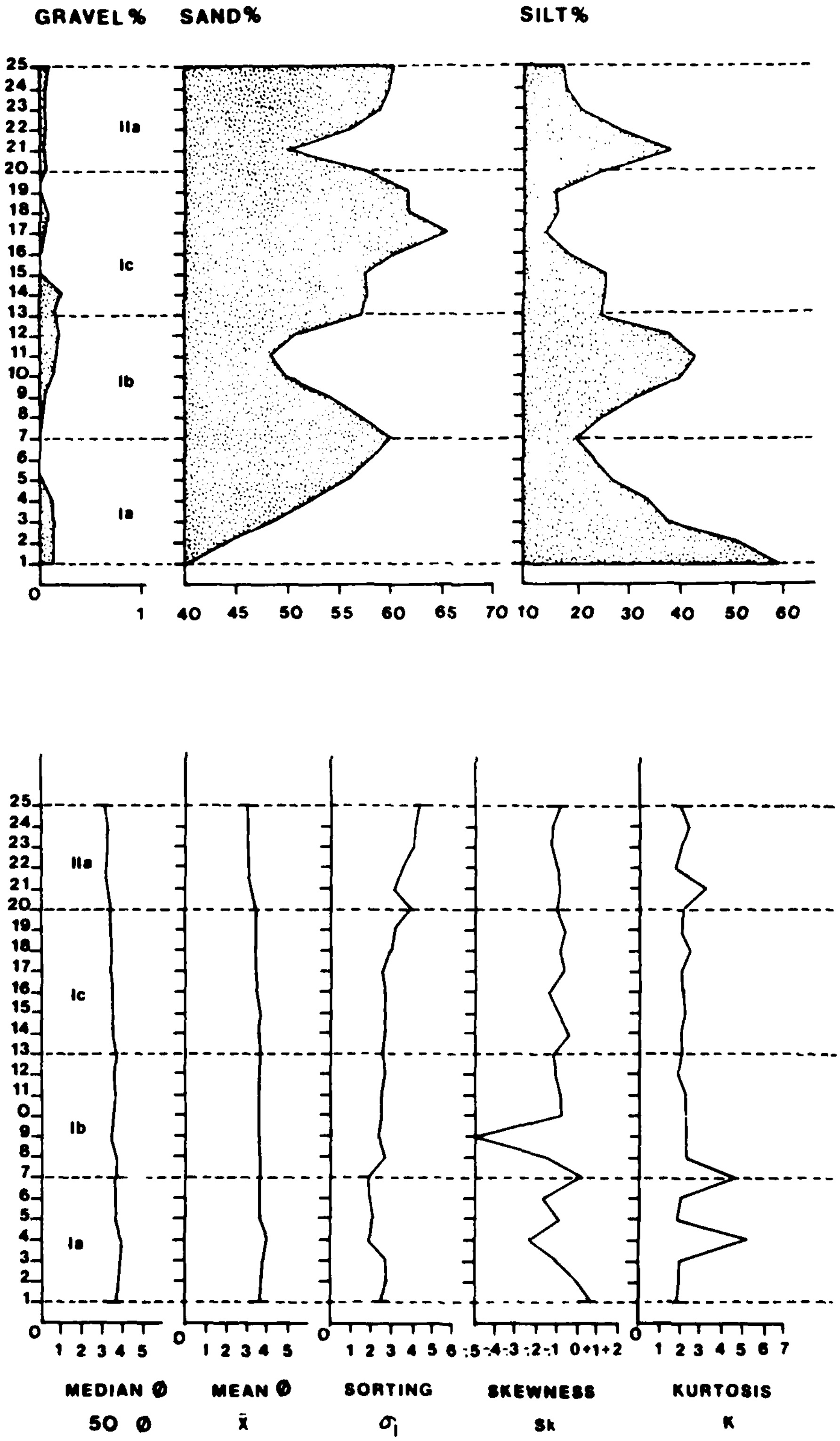

Figure 35. Comparison of silt, sand, and gravel, by level, X-1004, Area V.

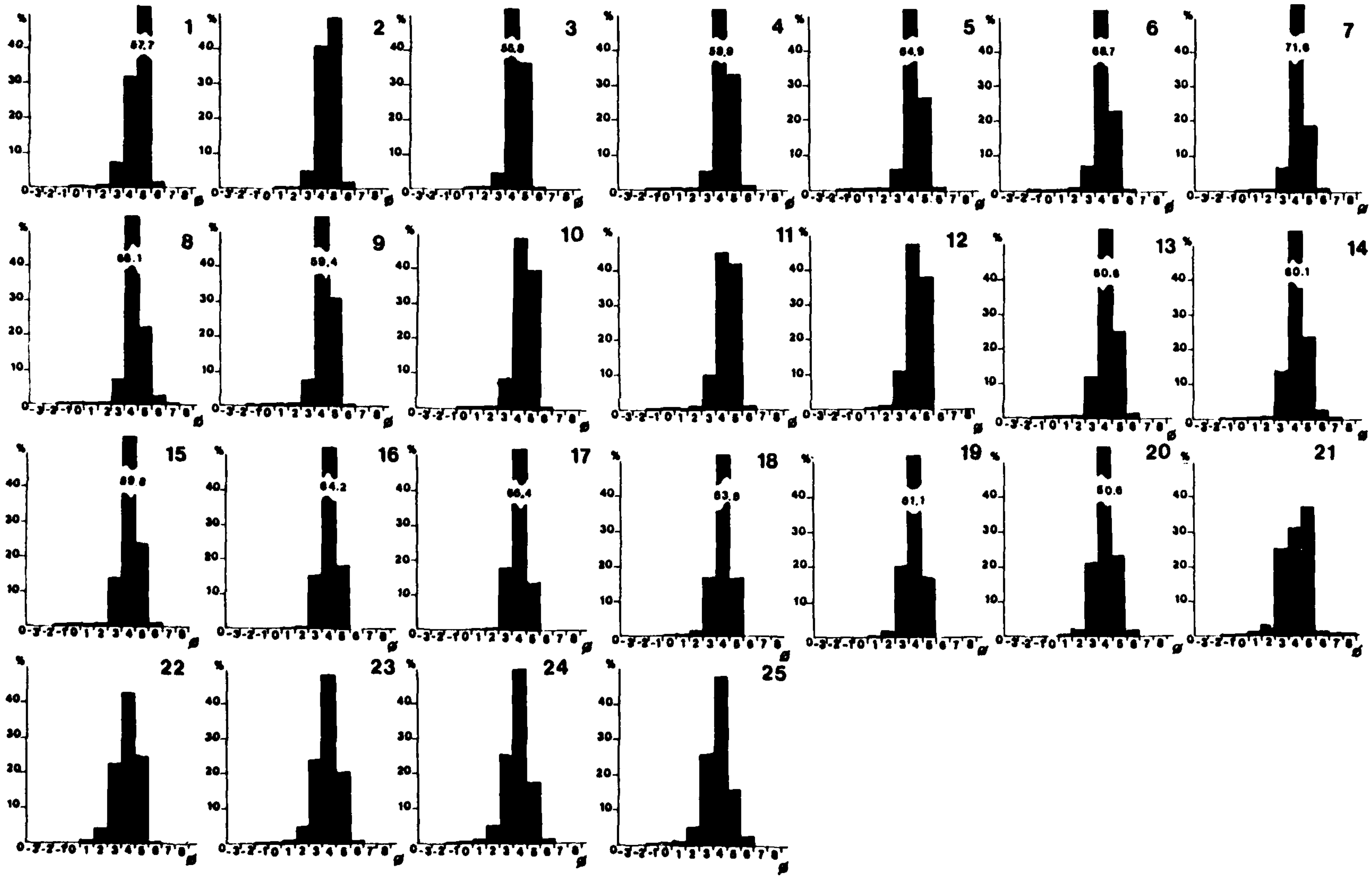

Figure 36. Grain size distribution, V-1004, Area V.

Levels 3-7, Unit Ia	Slight increases in gravel with accumulation suggests very slight increases in water discharge throughout the system. Gravel percentages remain low, however, indicating low-energy stream deposition. Sand and silt fractions also increase and decrease slightly, suggesting a relatively stable condition (Table 23).
Levels 8-12, Unit Ib	Sand and gravel percentages increase significantly to a maximum of 84.7% and 4.5% respectively. These increases suggest a slight increase in the velocity of the depositional medium. These sediments are coarse in texture and have a mean grain size of 3.56 to 3.66 phi.
Levels 13-15, Unit Ic	Gravel and silts increase with accumulation of the deposits to a maximum of 3.08 and 39%, respectively. Sand frequencies, however, decrease, suggesting decreased velocity of the depositional medium. The increase in gravel is puzzling but may reflect surface disturbance prior to the deposition of the redeposited soils represented by Levels 16-19.
Levels 16-19, Unit IIa	Redeposited soils and cultural debris are represented by poorly sorted and mixed soils. Gravel frequencies are high with frequencies of 19.16%, 13.43%, and 7.45%, and sand frequencies vary between 62-70%. Mean grain sizes are somewhat larger than in the underlying deposits, suggesting a coarse-textured sediment (Table 24).

Figure 37. Comparison of silt, sand, and gravel, by level, X-593, Area VI.

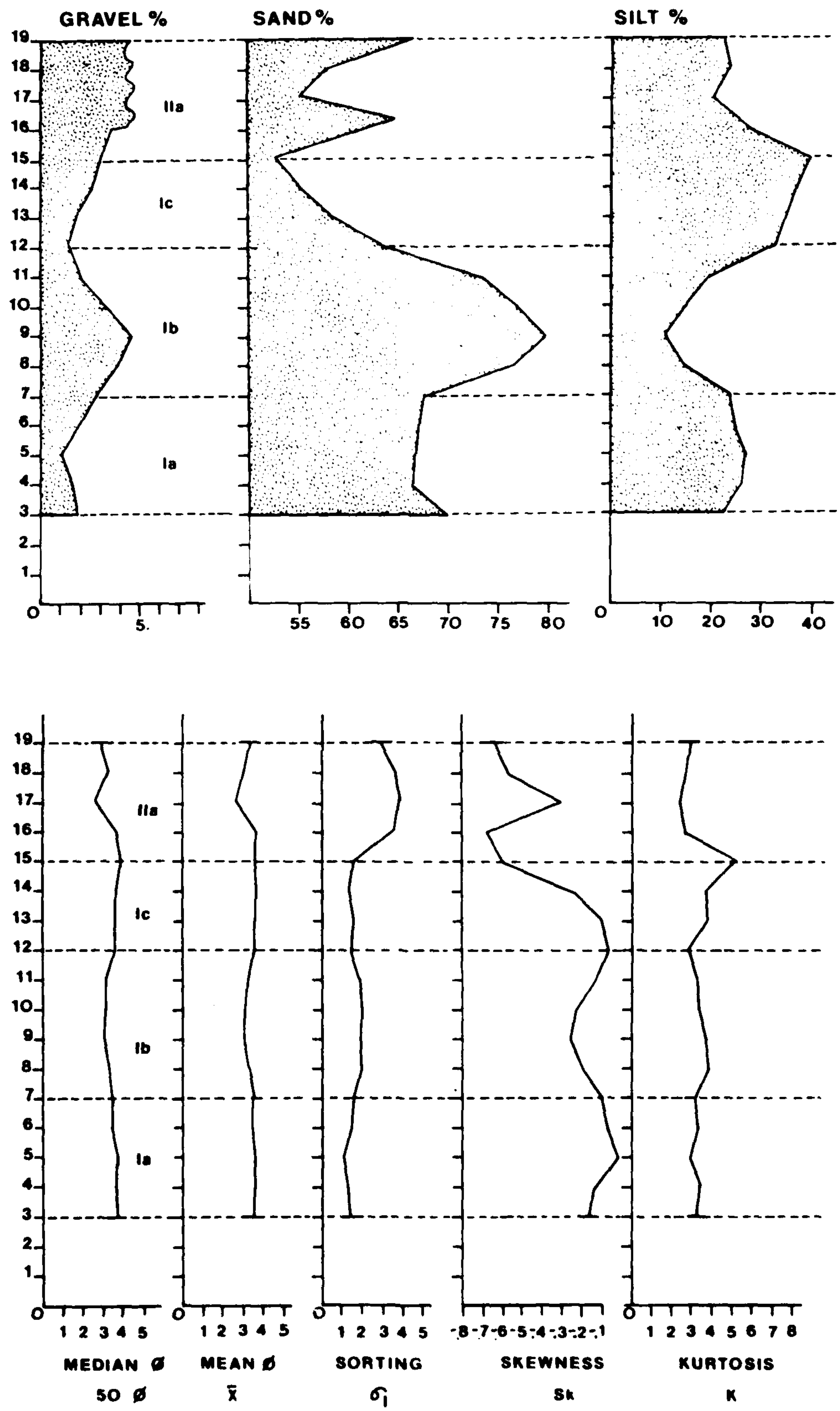

Figure 37. Comparison of silt, sand, and gravel, by level, X-593, Area VI.

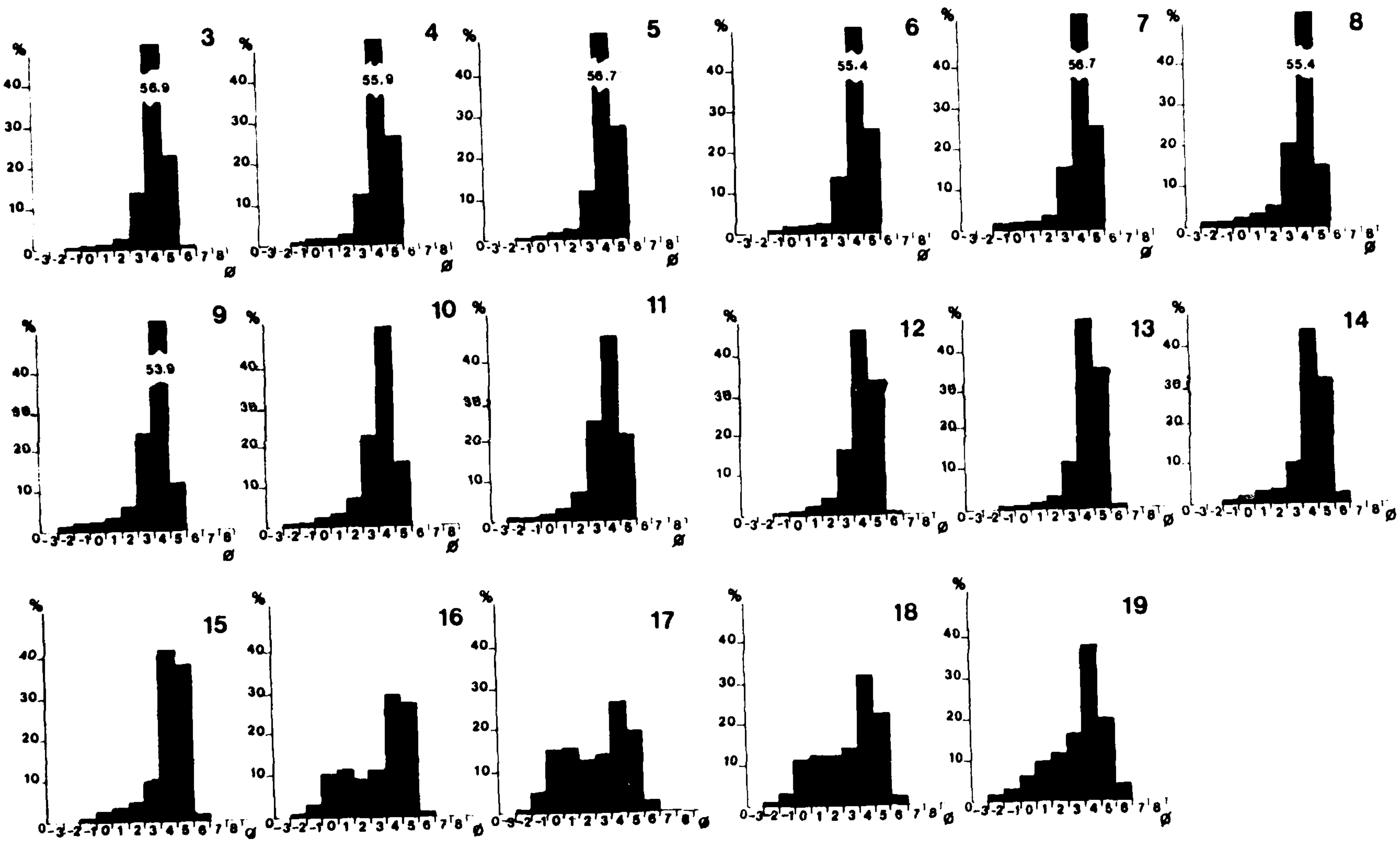

Figure 38. Grain size distribution, X-593, Area VI.

The disturbed deposit, unlike that in Area V, is easily discernible in the granulometric frequency diagrams. The upper 35 cm contains amounts of gravel in excess of 10% in some levels, well above the amount that would be expected to be deposited by a low velocity stream (Figure 37). The bimodality shown in the histograms (Figure 38) is also suggestive of a disturbance of the deposit. Bimodality in any sample indicates mixing of the deposit, which can only occur when coarse materials normally found at the base of a water-laid deposit are brought to the surface and mixed with finer sediments. Frost action can cause mixing but more often it is the result of plowing and/or overturning of a developed soil horizon. The sediments in these upper levels are poorly sorted, very coarse in texture (Table 24), and have a mean grain size that varies between 2.16-3.60 phi.

The soil deposits below these greatly disturbed sediments are similar to those found in Area V, and are moderately well to well sorted, grade from coarse to fine, and exhibit a mean grain size of 3.60 phi with little variability. These deposits also appear to represent a series of overbank flood deposits laid down by a low-energy stream.

Area VIII

This area is located beyond the second road on the southernmost edge of the main hatchery complex south of the concrete raceways. The deposits are greatly disturbed and appear to be largely redeposited materials used to help level the area prior to the construction of the hatchery facilities. Historical debris was found in test units excavated below 1 m. In addition, most of the sediment samples from the area (Figures 39 and 40) do not exhibit the coarse-to-fine gradation (Levels 7-15, X-191) which would be expected if the

Levels 1-3, Unit Ia	Levels 1-3 contain relatively high frequencies of gravel and sand, with lesser amounts of silt. The mean grain size is of the order of 3.1 to 3.3 phi and the texture of the deposits is very coarse. Although the deposits are moderately sorted, there is considerable variability throughout the unit horizontally. The deposits appear to represent relatively high-energy transport and could be interpreted as a stream channel buried by subsequent over-bank sediments. Cut-and-fill structures appear in the soil profiles of this and adjacent units.
Levels 4-6, Unit Ib	The sand, silt, and gravel fractions present in these three levels suggest water transport and material deposition. The decreasing frequencies of sand and gravel from a maximum of 81-65% for sand and 7.8-4.1% for gravel suggest decreased water flow. The corresponding increase in silt from a minimum of 10.6% to 27.4% is what would be expected if the depositional medium was losing energy. It would appear that this deposit has been only slightly altered, if at all, by construction activities at the Hagerman site.
Levels 7-8, Unit Ic	Levels 7 and 8 indicate disturbance, perhaps related to the construction of the fish hatchery complex. Sands increase in frequency at the expense of silt and gravel. Some bimodality exists in the histograms drawn of the sediments (Figure 40) and Folk and Wards' inclusive graphic skewness indicates an increased skewness in the direction of coarse-sized particles. The deposit probably represents an old surface that has been modified and subsequently covered by redeposited soils. The soils in the levels from the overlying unit IIa are obviously redeposited material.
Levels 9-15, Unit IIa	All of the soils and sediments present in these levels have been redeposited. All of the samples collected were obtained from strata containing relatively high frequencies of historic material (concrete fragments, peach pits, etc.). Prehistoric artifacts and the soil matrix in which they were present have been transported from other areas. No evidence exists for in situ deposition of the soil matrix and the associated prehistoric artifacts.

Figure 39. Comparison of silt, sand, and gravel, by level, X-191, Area VIII.

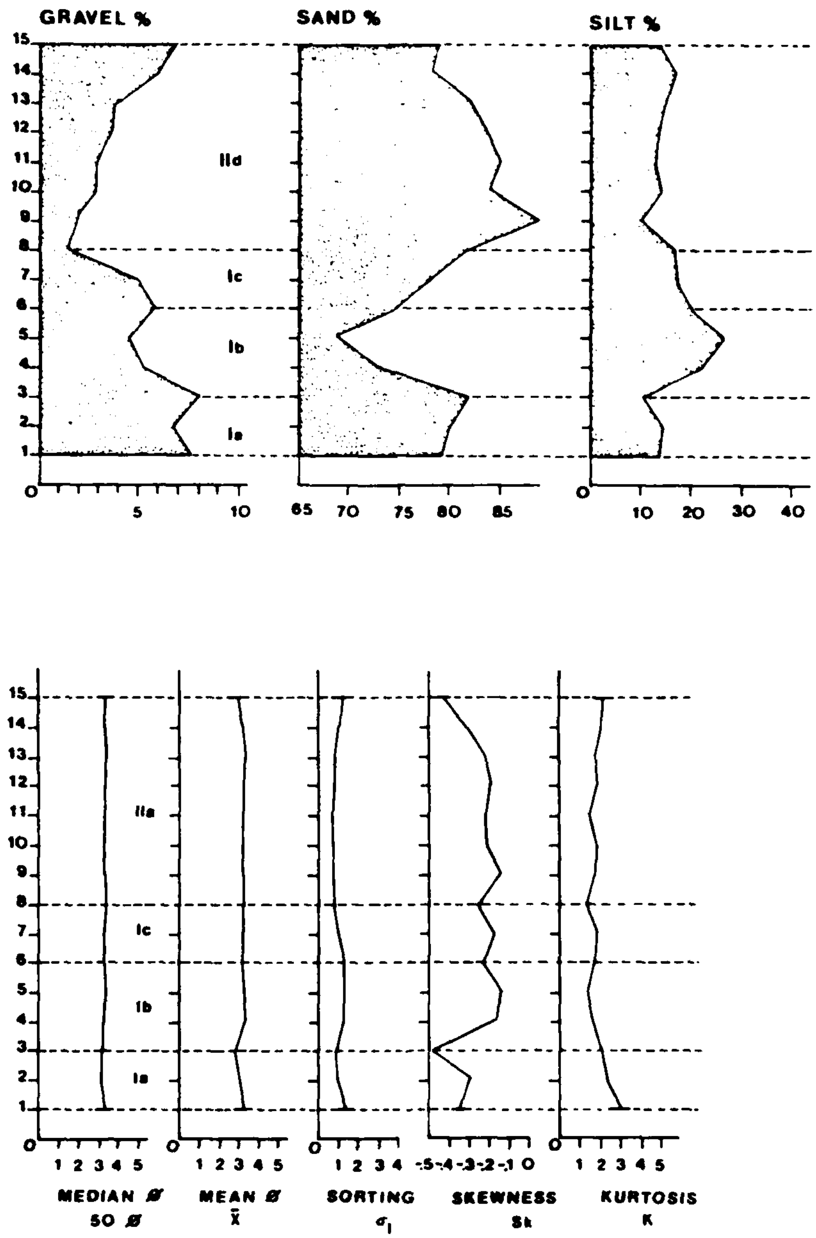

Figure 39. Comparison of silt, sand, and gravel, by level, X-191, Area VIII.

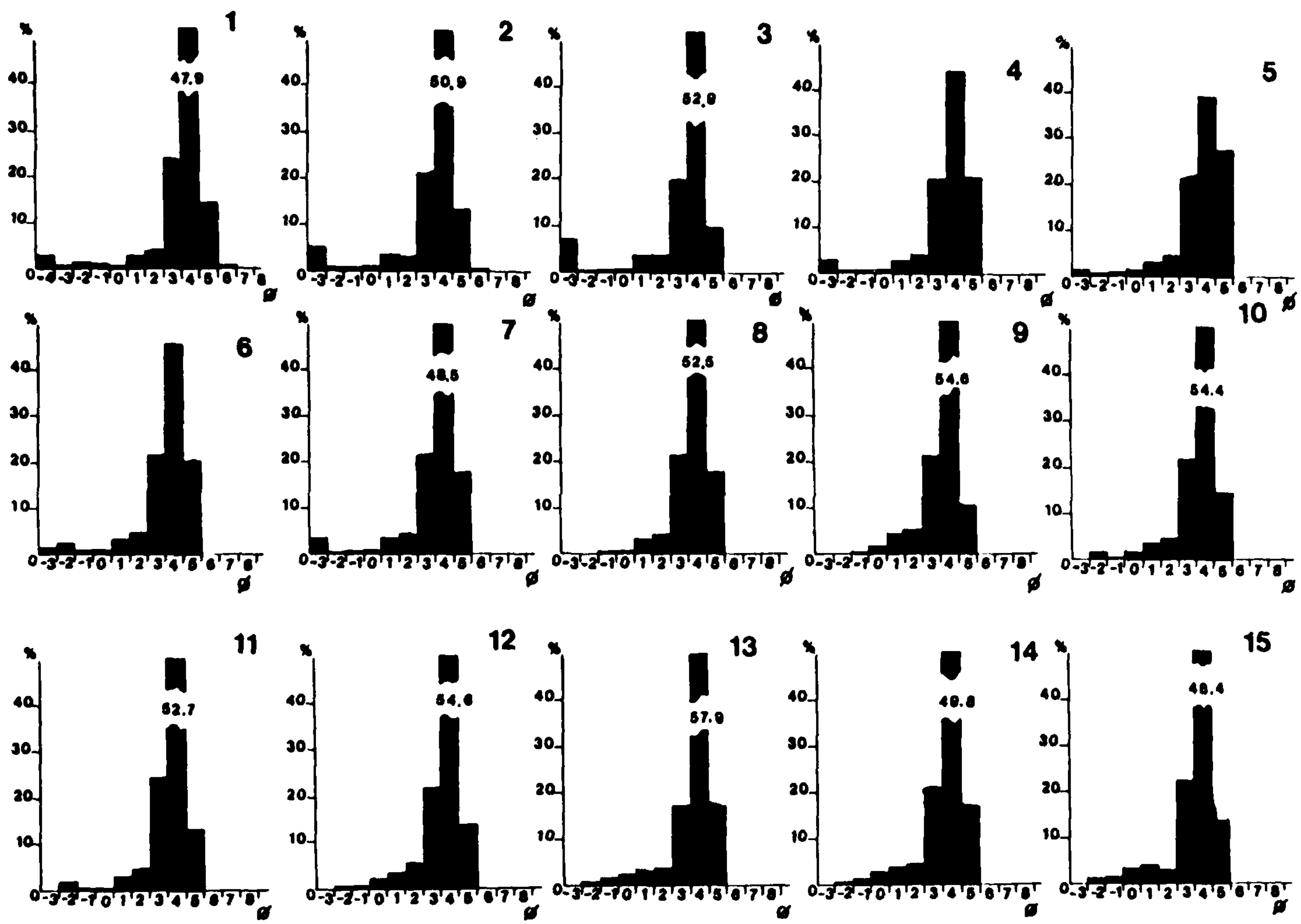

Figure 40. Grain size distribution, X-191, Area VIII.

deposits had been water-laid. Slope wash and other erosional mechanisms cannot be ruled out, but no evidence was found to support these modes of sediment transport.

Disturbance and redeposition of materials occurred below 1 m in most of the units tested. Those excavation units containing primary water-deposited sediments are few, and the deposit is usually very thin, lying just above the basalt bedrock.

Area IX

Area IX is situated just west of the concrete raceways. Unlike the other test areas, this area contains only redeposited materials, both historic and prehistoric.

An examination of the grain-size statistics and the sand, silt, and gravel frequencies is inconclusive. The material is so well mixed that distinctive sediment horizons cannot be separated easily. The soils and the sand, silt, and gravel frequencies seen in the grain-size curves (Figure 41) may have been more affected by localized soil-forming processes than by the mode of deposition. The sequence in which the high frequency of gravel is followed by an increase in sand followed by an increase in silt-sized particles could be interpreted as a classic overbank flood deposit (Figure 42). However, the stratum contains rusted iron pieces, fragments of concrete, nails, wire, glass, basalt and other debris, all of which argue against these being prehistoric flood deposits.

The high frequency of gravel-sized particles at the base of the deposit may be the result of weathering of the basalt bedrock. An examination of these units under a 10X hand lens indicated the presence of basalt and

Levels 1-4, Unit Ia	The presence of high frequencies of gravel-sized particles (on the order of 15%) and the presence of basalt particles in the gravel fraction is suggestive of weathering as opposed to water transport and deposition. Although sand frequencies increase with accumulation of the deposit, these frequencies appear to be fortuitous. The soils in these levels are poorly sorted, have a mean grain size of 2.43 to 3.4 phi, and have a very coarse texture as indicated by the grain-size statistics (Tables 23 and 24). Water transport is rejected on the basis of the excavation evidence and upon the fact that historic archaeological debris occurs in the basal strata.
Levels 5-7, Unit Ib	The soils in Levels 5-7 contain relatively high frequencies of silt and sand and almost no gravel-sized particles. The sand frequency varies from a maximum of 83.7% to a minimum of 73.4%, and the silt varies from a maximum of 23.4% to a minimum of 14.9%. The mean grain size in the three levels varies only slightly, from 3.4 to 3.46 phi (Table 24). The texture of the deposits is coarse and the sample analysis indicates that the soils are moderately sorted. Water transport and deposition are rejected as primary processes. The presence of historic debris argues against this interpretation and for cultural redeposition.

Figure 41. Comparison of silt, sand, and gravel, by level, X-2001, Area IX.

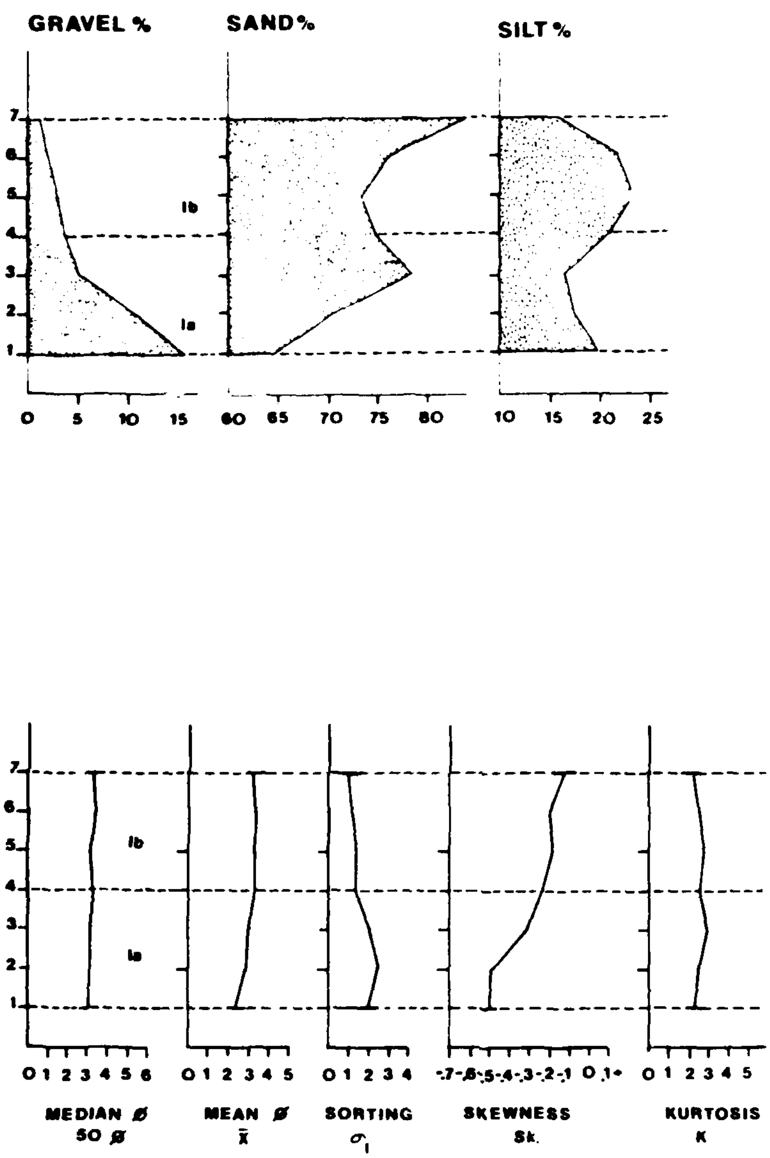

Figure 41. Comparison of silt, sand, and gravel, by level, X-2001, Area IX.

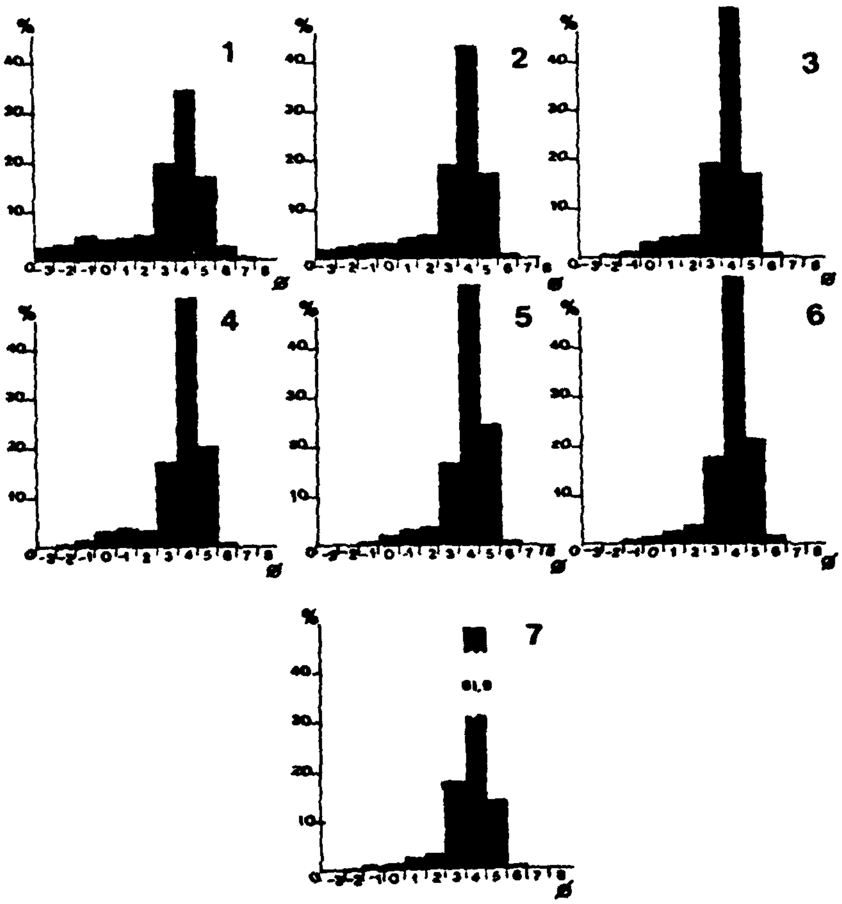

Figure 42. Grain size distribution, X-2001, Area IX.

concrete in the gravel-sized fraction. The high frequency of sand in the middle layer may reflect, not an increase in sand, but a lack of gravel. Some support for this interpretation can be found in the relatively high (about 20%) frequency of silt at the base of the deposit, which would be expected if water were continually being added to the soils and silt-sized particles were being leached from the upper profile.

Conclusions

The soils and sediments analyzed at the Hagerman National Fish Hatchery site suggest that the original deposits were laid down as overbank sediments from a relatively low-energy stream. The concentration of materials of the 4 and 5 phi sizes and the absence of large particles of the -1 to -6 phi sizes in all sediments argues against a high-energy stream as the depositional medium.

The deposits do not appear to have undergone extensive wind modification or transport. The particles do not exhibit saltation pitting when viewed under a 10X hand lens and the histograms indicate clustering about the 4 and 5 phi sizes; deposits reworked by wind usually sort out at the 2-3 phi size. The presence of particles of the 4, 5, and 6 phi sizes indicates wind deposition at some distance from the source area. Wind-deposited materials do not normally grade vertically from coarse to fine, but do so horizontally over distances many miles from the source area. Wind-deposited materials are generally relatively homogeneous in size, exhibit a leptokurtic to very leptokurtic kurtosis when the grain size histograms are plotted, and usually are very well sorted.

The modified and subsequently redeposited units which occur near the surface at many of the tested sites exhibit characteristics which are quite different from those of the underlying water-deposited sediments. The redeposited units are very poorly sorted, coarse in texture, and often contain historic debris in the soil matrix.

The three depositional units clearly illustrate the use of grain-size analysis and interpretation. Not only can one recognize and describe the depositional environment, but one can also separate disturbed soil horizons from undisturbed soil horizons. No obvious evidence of prehistoric disturbance of natural deposits was found. This is not particularly surprising, as such disturbance would usually occur only in and around cultural features (e.g., housepits), and the redesigned construction plans were arranged to avoid such features.

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